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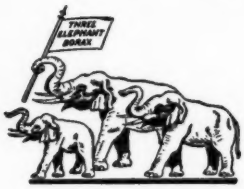


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# Better Crops with PLANT FOOD

The Whole Truth—Not Selected Truth

R. H. STINCHFIELD, *Editor*

*Editorial Office:* 1155 16th Street, N. W., Washington 6, D. C.

VOLUME XXX NO. 4

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WAITING FOR SOMETHING TO HAPPEN!

Better Crops with PLANT FOOD

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VOL. XXX WASHINGTON, D. C., APRIL, 1946 No. 4

***Recognizing . . . . . .***

# RICE RESURGENT

Jeff McDermid

THE rise of rice in public significance has proceeded minus much acclaim until recent world famines have catapulted our continent into a major supplier of this great food staple, long associated with the tropics.

It only goes to show how things will happen when your back is turned. Hereabouts, at least in my familiar bailiwick, rice has spelled something to mix with raisins for a quick dessert pudding, or perhaps a traditional showering material with which to besprinkle the pathway of newlyweds. Of course, betimes some of us went down to the city and sampled chop suey or chow mein layered with mounds of flaky rice doused with "dragon blood" sauces, or peered into Ying Ling's shirt-tearing foundry to see him ladling rice from bowl to belly amid the soapsuds.

And as I said, the shift in rice production has been so gradual and unheralded by advertising pomp that some of us awoke with a bang yesterday to learn that Brazil and the United States are the greatest rice countries outside of monsoon regions of Asia. We also found out that rice is a staple diet for more of this world's hungry hordes than wheat, especially to those populations in areas subject to the worst recurrent famines as well as the most unreliable and unfair distribution systems known to mankind. As major

suppliers of rice we can help correct the former evil, but only decent organization and local responsibility can mend the latter obstacle.

Time was, not so long ago, when we imported much rice. Now this country is not only self-sufficient in this cereal but, together with Brazil, our production accounts for nearly three-fourths of the commercial rice output of the western hemisphere.

No figures are at hand about our domestic use of rice as a whole beyond an estimate that each American manages somehow to get outside of six pounds of it in a year, possibly including that generous portion which finds its way to the pavement on wedding days and is lost forever to the stomachs of famished ones.

BY a little diligence I find that rice consumption takes on a decided regional complexion, and it "disappears" at a faster clip from stores in certain states compared to others and to the national average. Up in the stony and frigid hills of Vermont and New Hampshire the canny Yankees consume only about a tenth of a pound of rice apiece in the course of a year. In only eight states does the rice-consuming rate exceed that of the six-pound national level. Down in the Southland for some reason the per-capita eating of rice has risen to 30 pounds in Carolina and 40 pounds in the bayou zones of Louisiana. One must seek some reason besides economy in food for an excuse to explain that difference, as long as you find old New England boiling so little of a low-cost cereal. Anyhow, what they didn't eat in Rutland or Exeter helped this country jump its exports of the white grain in milled form from 70 million pounds in 1936 clear up to 490 million pounds last season.

What boomed the rice paddies and mills in our deltas was, of course, the disruption of overseas and inland transport from surplus Asiatic lands to oriental shortage areas that are customarily huge consumers of rice. The latest dope is that Asia's milled rice output this past crop year is 40 *billion* pounds below the prewar average. The Rising Sun aggression put the wet blanket on seeding and harvesting processes, robbed storages, and put the burden of supporting a wave of rice-hunger on the one single current harvest now under way in Asia.

Countries said to possess a total exportable margin amounting to about two billion pounds this season are notably Burma, Siam, and French Indo-China, whereas before the war the surplus from the big rice centers there created nearly 20 billion pounds of yearly reserves to ship outbound. In Formosa and Korea the rice gatherers will hardly glean enough to fill their own larders.

But in China, native habitat and traditional user of rice foods, the deficit staring them in the belly is the biggest in the whole Asiatic sector. All the old snarls and bungles affecting inland traffic combine to put chaos in the rice kettle there. Some provinces probably have a surplus and no reliable and modern ways or methods to haul it to places in direst need.

JAPAN used to beg, borrow, and steal over four billion pounds of rice every year from its colonies, added to which loss of resources the present crop there has failed and left them perilously short of enough to serve in homes and pagodas and geisha houses. Naturally, we of the minor rice-raising zones with our small percentage of the world's total production are utterly unable—try as we may by saving something on our diets—to contribute over a tiny driblet in the enormous stewpot now empty in the Orient.

And that isn't all of it either. Loss of work cattle and field equipment during the invasion of the Philippines has left the planters illy prepared to meet this surge of accumulated rice demand near home. In fact they never did either, being heavy importers and big eaters of rice before the war. Much of the same situation goes for British Malaya

and the Netherlands East Indies, too. They are all busted on rice and know no substitute. As a cap sheaf to the stack of miseries clouding the picture we find India and Ceylon stricken by drought, which blasted their chances to feed themselves, let alone to share with neighboring destitute rice devotees.

So we have countries like Hawaii, with an annual rice consumption rising to 175 pounds per capita, as well as China, Japan, and the Philippines clamoring for aid in some form from somewhere. No wonder we come back into this hemisphere to scan the crop prospects ahead and see none too cheering outlooks for our being able to keep anywhere close to the world demand for rice in the present, as well as in the coming year.

I suppose we really cannot realize ourselves what dependence on a single crop or a limited one-item diet means to life and hope. We raise wheat, the staff of life, so-called, and yet we enjoy such a variety of other edibles all year long that it seems incredible to us that mid-continent Europe beckons to us for our crumbs to keep body and soul together. I presume it will be the same with our rice business—just a commercial thing, a chance to make money for awhile on hunger cycles—and then forget. But maybe we will let it sink in this time, how little there is between humanity and actual want, especially when we waste our substance on munitions and destruction.

Let's take a partial roll call of this hemisphere respecting rice outlooks for 1946 and run some risk while doing so of making advance guesses of climatic and pest hazards lying in wait to trip us up. Most of our farm folks living outside the natural rice-raising sections have paid no more attention to the ups and downs of the white kernel than they have to peanuts—and look what's happened to peanuts meanwhile.

We have been so much in the habit of swelling out our chests and thumping our ego with braggart yarns anent the red-meat belt, the hybrid-corn tonnages, the wheat harvest, and the pork and poultry business that we have neglected to find out a darn thing about the ability some of our brother farmers have to meet a world rice crisis.

Planting intentions for 1946, as summarized in recent national estimates from Arkansas, Louisiana, Texas, and California, show six per cent over the earlier goals and four per cent above the acreage of last year. Back in the fall of 1945 the trained-seal estimators figured that we could get along with about 19 million bags of milled rice that would require about 1,406,000 acres based on yield rates of about 46 bushels an acre with normal mill returns. Later, when the rice scare boiled out of the pot, they put up the goal slightly to 1,479,000 acres, but the planters reported signs afoot that about 1,575,000 acres would be sown this season. Inasmuch as rice growers somehow managed to break records in wartime on scarce help and short supplies, the facilities for raising rice this season should be no worse, they argue, and hence they will take a dare and do their durndest.

THANKS to Hank Wallace's statisticians in the Commerce Department, I am able to unload a few facts concerning South American and Mexican prospects for raising chop-suey mash. Compared with Asiatic tonnages it doesn't loom large, but it's an improvement anyhow.

Brazil's chief rice region is Rio Grande do Sul, and this coming season an increased seeding of 20,000 acres has been planted there, to make the

(*Turn to page* 50)

# Potash Losses on the Dairy Farm

*By A. R. Midgley and K. E. Varney*

Department of Agronomy, Agricultural Experiment Station, Burlington, Vt.

LIVESTOCK farming is one of the best means of conserving soil fertility. Most of the land is continually in hay and pasture, which reduces erosion and leaching losses to a minimum. In addition, with this system of farming it is possible to return to the soil a large portion of the plant nutrients that are removed in crops, but the theoretical and actual amounts that are so returned are quite different. About three-fourths of the plant-food elements contained in crops which are harvested and fed to livestock are excreted in manure, and only one-fourth are contained in milk and livestock.

However, to get the entire three-fourths back to the field for re-use by crops requires real thinking and planning and even then it is very difficult, if not impossible. This is primarily because of the difficulty in handling manure without excessive losses. In the case of potash, both leaching and run-off losses are often very large because most of the potash is water-soluble and present in the urine.

Dairy farmers spread a considerable amount of manure during the winter on ground that is frozen and covered with snow. Frozen land is impervious to water and considerable run-off occurs in the northern states during the spring thaws, especially if they are accompanied by rain.

The relationship between precipitation and run-off during the late winter and early spring at Burlington is shown in Fig. 1. In general, the greatest run-off occurs during March, but it is evident that considerable snow evaporates during the winter because the amount of run-off is much less than the total precipitation (rain and snow) during this time. To determine run-off losses from manure spread during the winter, studies were conducted covering periods ranging from three to six years.

A series of enclosures (with no tops or bottoms) were constructed in 1935 on 10 and 20 per cent slopes at the University Farm to catch all the water which runs off the surface (Fig. 2). Duplicate samples of the run-off liquid were obtained for analysis after each thaw.

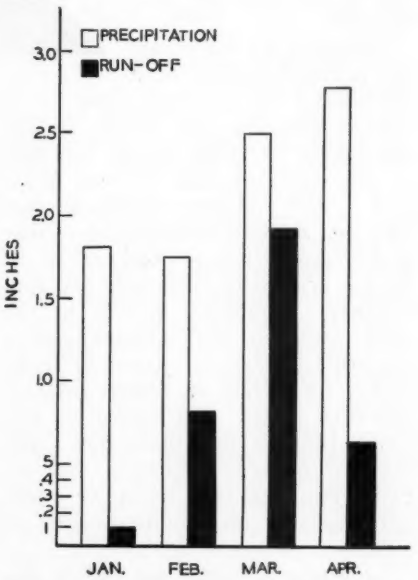


**Fig. 1.—Average precipitation and run-off at Burlington, Vermont, over a six-year period. Greatest loss occurs in March during the spring thaw.**

Fresh cattle manure was usually spread within these enclosures in late December or early January at a rate of 10 tons per acre. Since superphosphate is often used in the stable gutter, its

effect on manure run-off was also studied, as well as the effect of adding limestone to phosphated manure at the time of spreading. Superphosphate was used at the rate of 50 pounds, and limestone at the rate of 100 pounds, per ton of manure. Nitrogen, phosphorus, and potash losses were determined, but only the potash losses will be considered here.

### Potash Run-off Losses

Most of the potash contained in cattle manure is in the urine. It is very soluble and therefore subject to run-off, which accounts for the large losses reported in Table 1.

When superphosphate was added to the manure, potash losses were usually increased. This seems to be due to the replacement of some of the potash in the exchange complex of manure by the calcium in superphosphate, which contains nearly 60 per cent calcium sulphate. Furthermore, superphosphate helps to retain some ammonia in the manure and this ammonia is also free to replace some potash which was originally held in the solid exchange material of manure. This replaced potash then becomes soluble and susceptible to run-off.

When ground limestone was added to phosphated manure at the time of spreading, potash losses were reduced. The reason for this is not clear although it has long been known that heavy liming may greatly reduce the solubility of potash in soils and often its availability to plants. Thus, while neutral or acid calcium salts (sulphates, phosphates, etc.) may increase potash solubility and susceptibility to run-off, the carbonate and hydroxide forms seem to reduce them.

TABLE 1.—POTASH RUN-OFF LOSSES PER ACRE FROM 10 TONS OF MANURE

| Plot treatment | Potassium losses expressed in pounds of 50 per cent muriate of potash | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1936 | 1937 | 1938 | 1939 | 1942 | 1943 | Average |
| Plots on 20 per cent slope | | | | | | | |
| No treatment | .1 | .1 | 0.0 | .5 | ..... | ..... | .1 |
| Manure only | 26.8 | 33.6 | 39.8 | 53.4 | ..... | ..... | 38.4 |
| Manure and superphosphate | 30.1 | 35.0 | 40.6 | 60.3 | ..... | ..... | 41.5 |
| Plots on 10 per cent slope | | | | | | | |
| No treatment | .6 | 0.0 | 0.0 | .8 | .1 | .1 | .2 |
| Manure only | 60.5 | 71.8 | 34.0 | 100.2 | 16.0 | 47.0 | 54.9 |
| Manure and superphosphate | 69.4 | 68.2 | 35.1 | 105.0 | 25.0 | 71.0 | 62.3 |
| Manure and hydrated lime | ..... | ..... | ..... | ..... | 20.0 | 70.0 | 45.0 |

These results indicate that the degree of slope may be a minor factor, because frozen ground is impervious to water and any slope may cause wash-off. The greatest factor is the amount of snow present at the time of the thaw. The location of the plots on the 10 per cent slope allowed them to accumulate more snow than plots on the other slope. This and the fact that some of the records were taken during different years account for the differences. Taking all trials on both slopes, manure alone (without amendment) gave an average yearly loss of potash equal to 46.6 pounds of 50 per cent potash for each 10 tons of manure used.

These field results show that substantial amounts of potash may be lost from run-off during the winter, especially on an average dairy farm. Good dairy cattle will usually produce a ton of manure per month. Since they are

**Fig. 2.—Winter view of run-off plots on 20 per cent slope. Manure applied on snow last of December. Two plots without manure are visible.**

often in the barn at least six months of the year, a one-man dairy farm of 15 cows will produce 90 tons of manure during the period the cows are stabled. The annual loss from this amount of manure would be equal to about 420 pounds of 50 per cent potash.

A number of laboratory trials were also conducted using small artificial run-off pans (Fig. 3). These rectangular-shaped pans with an outlet tube at one corner were of sufficient size to accommodate 500 grams of manure, spread at a rate equivalent to 10 tons per acre. The bottom of each pan was covered with an equal amount of snow and then the treated or untreated manure was spread over this. The pans were then set outside under freezing conditions for 10 days before sufficient additional snow was added to give about 1,500 cc. of run-off liquid when the pans were brought indoors and the snow allowed to melt.

The liquids obtained from the pans receiving different manure treatments were comparable in color to the liquids obtained under field conditions, except that they were darker and contained more soluble organic matter. Run-off water from untreated manure was about twice as dark as from manure receiving superphosphate. This is due to the precipitating effect of the calcium salts contained in superphosphate. Potash run-off losses under these laboratory conditions are shown in Table 2.

While these laboratory trials show greater losses than would ordinarily result under field conditions, yet it is evident that large amounts of soluble potash may wash off the frozen, impermeable ground if sufficient melting snow is present. Without superphosphate, over 50 per cent of the total potash contained in manure readily runs off. With superphosphate, even greater amounts were lost, while the addition of limestone to the phosphated-manure reduced the loss.

Of course, larger amounts of potash could have been removed from this manure with additional melting snow. However, on the above basis, the 90 tons of manure produced on a 15-cow farm during the winter contain at least 900 pounds of 50 per cent potash which are subject to run-off under severe conditions. Such losses seldom occur in practice but these figures indicate a big

TABLE 2.—POTASH RUN-OFF LOSSES FROM 10 TONS OF MANURE UNDER LABORATORY CONDITIONS

| Treatment per ton of manure | Potash losses expressed in lbs. of 50% muriate of potash |
|---|---|
| Manure only | 100 |
| Manure and superphosphate | 131 |
| Manure and superphosphate with 100 lbs. of limestone added while spreading | 105 |
| Manure and superphosphate with 200 lbs. of limestone added while spreading | 101 |

NOTE: Ten tons of manure contained an equivalent of 180 lbs. of 50% muriate of potash.

potential leak in the maintenance of potash on a dairy farm.

### Summer Potash Losses

The manure produced by cattle while on pasture during the summer is poorly distributed and utilized by plants. Much manure is deposited in lanes and roadways leading from pasture to barn, as well as near streams, trees, and other shady places. Unfenced woodlots also receive large amounts of droppings on land which is unsuited for growing pasture herbage. Since much of this manure is derived from vegetation grown on the better land, some of the potential producing capacity of the manure is lost to poor land by this process.

Even when the manure is deposited on good pasture land, its high concentration and poor distribution greatly reduce its efficiency. This becomes evident from the following data.

Cows on pasture deposit an average of about three pounds of urine or 1½ quarts at a time. Of course this amount varies greatly and large cows may produce considerably more. The spots receiving such deposits are very evident

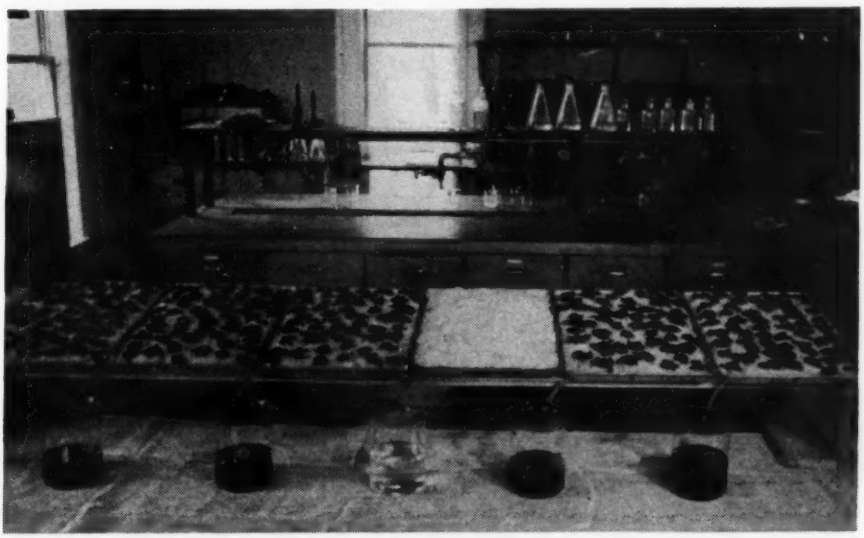

Fig. 3.—A set of laboratory run-off pans showing outlet tubes and beakers for collecting run-off liquid. The pan in center received snow only.

during the summer and fall, as seen in Fig. 4. The total area included in one of these urine spots varies greatly, but an average of 50 measurements showed them to be 23.3 inches in diameter. The above amount of urine on an area of this size is the equivalent on an acre basis of about 556 pounds of nitrogen, 6 pounds of $P_2O_5$, and 601 pounds of $K_2O$, or about 5,560 pounds of a 10-.1-11 fertilizer per acre. This is a very poorly balanced fertilizer as it contains practically no phosphorus. The nitrogen and potash, on the other hand, are so excessive that leaching losses no doubt occur on many light soils.

The vegetation around these spots has also been found to be poorly balanced and this no doubt is one reason why cattle often refuse to eat it. Samples of Kentucky bluegrass growing on urine spots were compared to similar grass growing a foot or so away with the following results:

| | % on dry wt. basis | | |
|---|---|---|---|
| | N | $P_2O_5$ | $K_2O$ |
| Bluegrass away from urine spots..... | 1.88 | .66 | 1.39 |
| Bluegrass on urine spots | 5.30 | .57 | 3.30 |

The urine spots produced bluegrass with nearly three times as much nitrogen and over two times as much potash as did similar grass near by. The nitrogen-potash content of grass grown on the urine spots is thus considerably higher than that ordinarily reported for well-fertilized pasture grass or even clover. (Using the factor 6.25, the protein content would be about 33 per cent.) The phosphate content is quite normal, but it is very much out of balance in relation to the high nitrogen and potash content of this grass.

Some workers have assumed that the odor around these areas is the main reason why cattle often refuse the vegetation. It is not very likely, however, that the urine odor persists after the first rainstorm. The flavor of this excessive nitrogen-potash grass may be the real cause. Is it any wonder, when the grass is grown on land receiving fertilizer at the rate of 5,560 pounds of a 10-.1-11 fertilizer per acre?

Quite often both feces and urine are deposited on the same area, which fur-

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**Fig. 4.—Manure droppings on pastures are evidenced by increased plant growth. The nitrogen phosphorus, and potash content of the urine deposited on these areas is equal to about 5,560 lbs. of a 10-.1-11 fertilizer. These excessive amounts of nitrogen and potash are poorly used by plant and soil and contribute to their loss on the dairy farm. The vegetation on these areas is poorly balanced and not relished by grazing cattle.**

**Sweet corn in the foreground, fertilized with 1,000 pounds of 0-8-0, yielded 3.2 tons per acre. Corn in the background, fertilized with 0-8-8, yielded 5.7 tons per acre.**

# Muck Soils Produce Quality Sweet Corn For Canning

*By N. K. Ellis*

West Lafayette, Indiana

SWEET CORN can be grown profitably and satisfactorily as a regular crop in the rotation on Indiana muck soils. It is better adapted to a short crop season than field corn.

Another advantage is that sweet corn for canning is harvested early and permits the seeding of a winter crop of rye. The stubble and stalks are disced and the field is seeded to rye with no other preparation. The corn residues rot sufficiently under these conditions and cause no difficulties with the spring plowing. Narrow-row crops such as onions, carrots, and beans are planted in fields which have had this treatment. With field corn the story is different. The amount of refuse left following field corn makes it practically impossible to plant narrow-row crops unless most of the old stalks and stubble have been removed. The readily decomposed sweet corn residues plus the rye cover crop make an ideal cover and green manure crop for such soils.

The profitable production of sweet corn on muck soils depends, of course, on the soil fertility, the variety, and the spacing. Of these, fertility is of great importance and it is necessary to use fertilizers containing a high percentage of potash.

TABLE 1.—RELATION OF YIELD OF SWEET CORN TO THE ANALYSIS OF FERTILIZER USED ON MUCK SOIL *

| Fertilizers used** | Tons per acre | Increase tons |
|---|---|---|
| Effect of potash | | |
| 1. 0–0–0 | 3.7 | ..... |
| 2. 0–0–24 | 4.8 | 1.1 |
| 3. 0–8–24 | 6.1 | 2.4 |
| 4. 0–8–40 | 6.1 | 2.4 |
| Effect of Phosphorus | | |
| 5. 0–0–0 | 3.7 | ..... |
| 6. 0–8–0 | 3.2 | −.5 |
| 7. 0–8–8 | 5.7 | 2.0 |
| 8. 0–8–24 | 6.1 | 2.4 |
| 9. 0–16–24 | 6.2 | 2.5 |
| Effect of Nitrogen | | |
| 10. 0–8–24 | 6.1 | ..... |
| 11. 4–8–24 | 6.0 | −.1 |

* Average of 9 years.
** Rate of fertilizer application 1000 lbs. per acre broadcast.

The importance of potash for sweet corn on muck soils is shown by the yields in Table 1. When used alone, it increased the yield over the unfertilized check by 1.1 tons per acre. Phosphorus, in addition to the potash, increased the yield another 1.3 tons, showing the need for both plant-food materials. However, when phosphate was used alone, the yield of corn was depressed. When potash was used in fertilizer mixtures higher than 24 per cent, with eight per cent phosphate, no additional increase was obtained. Phosphates higher than in 0-8-24 gave no appreciable increase. Nitrogen in 4-8-24 resulted in no increase in yield over 0-8-24.

It is believed that 1,000 pounds of fertilizer per acre are more than a sweet corn crop can utilize economically, and the data indicate that row application is superior to broadcast. From observations, it appears that 250 pounds of fertilizer per acre are not enough and that 1,000 pounds are too much. Five hundred pounds of 0-9-27 applied in bands beside the row gave a higher yield than 500 pounds or 1,000 pounds broadcast, or when the fertilizer application was split, with half of it being plowed down and the other half applied in bands beside the row.

As a rule, muck soils hold more moisture than other soils and so if sufficient fertilizer is supplied the crop, one would expect the yield to be related to the number of plants growing in a given area. In this trial plot it will be noted that where the corn was planted

**To save hand labor, mechanical pickers for sweet corn are being developed.**

TABLE 2.—RATE AND PLACEMENT OF FERTILIZER * FOR SWEET CORN 1945

| Treatment | Yield in tons per acre |
|---|---|
| 500 lbs. broadcast | 4.3 |
| 1,000 lbs. broadcast | 4.9 |
| 250 lbs. beside row | 3.9 |
| 500 lbs. beside row | 5.8 |
| 250 lbs. plowed down<br>250 lbs. beside row | 5.2 |
| 500 lbs. plowed down<br>500 lbs. beside row | 5.3 |

* Fertilizer commercial 0-9-27.

in hills with three stalks per hill (Table 3), the yield increased from 5.4 tons per acre on the 42 x 36 inch planting to 6.7 tons on the 36 x 30 inch spacing. This means that the space allowed for each stalk was reduced from 3.5 to 2.5 square feet per plant. When the sweet corn was drilled in the row, one stalk every 12 inches, the yield was further increased over one-half ton per acre. It is apparent that for this soil, the spacing limit was reached when the area for each plant was reduced to approximately 2.5 square feet.

The yield was slightly reduced and the number of marketable ears also reduced, when drilled in the row eight inches apart. This may be because some ears were too small to harvest or there were more barren stalks. It appears from this data that the latter is the case, since single stock planting resulted in an increased number of ears per acre over the number of stalks per acre. Comparing the column on the theoretical number of stalks per acre to that of the actual number of ears per acre, Table 3, there are more ears than stalks on the wider spacing, but when only two square feet were allowed per plant, there were fewer ears than stalks. This evidence supports the theory that drilling is the best method of planting a sweet corn crop and on similar muck soils, drilling in 36-inch rows and at intervals of not to exceed 12 inches in the row would be the best.

TABLE 4.—COMPARISON OF SIX VARIETIES OF SWEET CORN GROWN ON MUCK SOIL, NORTHERN INDIANA MUCK CROPS FARM, 1945

| | Tons per acre |
|---|---|
| 1. Golden Cross Bantam | 4.2 |
| 2. Hoosier Bantam | 5.0 |
| 3. Purgold | 4.3 |
| 4. Golden Cross Bantam (red tassel) | 3.6 |
| 5. Illinois 10 | 4.3 |
| 6. Iowana | 4.1 |

Spacing 36 x 36 inches in hills, 2 stalks per hill.

Generally speaking, yellow corns requiring about 85 days to maturity make a more satisfactory crop on muck soils than the white sweet corns which require 95 to 100 days for maturity.

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TABLE 3.—RELATION OF YIELD TO SPACING OF SWEET CORN ON MUCK SOIL 1945

| Spacing | Sq. ft.* per hill | Sq. ft. per plant | Theoretical number of stalks per acre | Tons per acre | Pounds per ear average | Ears per acre |
|---|---|---|---|---|---|---|
| 42 x 36 | 10.5 | 3.5 | 12,445 | 5.4 | .76 | 14,720 |
| 36 x 36 | 9 | 3 | 14,520 | 6.4 | .77 | 15,755 |
| 36 x 30 | 7.5 | 2.5 | 17,424 | 6.7 | .78 | 17,020 |
| 36 x 24 | 6 | 2 | 21,780 | 6.6 | .77 | 17,020 |
| 36 x 12 | ..... | 3 | 14,520 | 7.3 | .72 | 20,700 |
| 36 x 8 | ..... | 2 | 21,780 | 7.1 | .73 | 18,975 |

* 3 stalks per hill.
Fertilizer 450 lbs.—60% potash (KCl.) plowed down
500 lbs.—0-9-27 broadcast

**Fig. 1.—Soil erosion has removed the greater part of the soil. Alfalfa will not grow unless the soil is fairly deep.**

# Alfalfa in Mississippi Decreased as Soil Fertility Declined

*By H. B. Vanderford*

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ALFALFA production in Mississippi has always been confined to the more fertile sections of the State and on soils that were high in lime. Prior to the initiation of alfalfa in the Mississippi Delta, the acres of land devoted to this forage crop were largely in the Black Belt section.

This Belt of heavy-textured, prairie-like soils is a crescent-shaped strip of land that is approximately 30 miles wide and extends from northeast Mississippi in a southeasterly direction to east central Mississippi, where it enters Butler County, Alabama. Soft marine limestone is the predominating parent material of the dark soils, although other geological strata are found interspersed throughout the area. The Black Belt soils comprise a great part of Monroe, Clay, Lowndes, Noxubee, and Lee Counties. The soils may be conveniently grouped into two general groups: the dark soils and the "Post Oak," or brown and yellow soils. Unfortunately, a small part of the area in Mississippi is comprised of dark soils. The "Post Oak" soils are acid in reaction and not well adapted for the production of alfalfa. The dark soils are about neutral to alkaline in reaction, and, if not severely eroded, will generally produce this legume.

## History of Alfalfa Production in Area

From the best information available, alfalfa was introduced in Mississippi

TABLE 1.—ACREAGE OF ALFALFA GROWN IN BLACK BELT COUNTIES OF MISSISSIPPI[1]

| County | Acres planted | | | |
|---|---|---|---|---|
| | 1909 | 1919 | 1924 | 1939 |
| Monroe | 1,183 | 5,154 | 337 | 1,690 |
| Clay | 1,632 | 2,820 | 23 | 207 |
| Lowndes | 1,268 | 2,504 | 585 | 333 |
| Lee | 745 | 1,905 | 484 | 798 |
| Noxubee | 1,018 | 898 | 230 | 281 |
| Chickasaw | 328 | 343 | 41 | 234 |
| Oktibbeha | 294 | 65 | 6 | 119 |

[1] Figures taken from U. S. Census Reports.

about 1890. Some was planted near Strong Station in Monroe County about this date and production gradually spread throughout the prairie counties. According to U. S. Census, the acreage planted increased rapidly during the 10-year period of 1909-1919 in the Black Belt section. It is difficult to tell from the census reports when the peak was reached, but according to leading farmers who once grew much alfalfa, it was near 1915.

About the year 1919 the farmers began to report that their alfalfa was failing. This is clearly shown by the fact that during the 5-year period from 1919-1924 the acreage planted decreased over 77 per cent. Complaints were made that yields were very small, that alfalfa did not live long, and that some strange unknown disease was destroying it. As a result, less land was planted to this fine forage.

The decrease in acreage planted to alfalfa in the prairie counties of Mississippi from 1919 to 1924 is shown in Table 1. In 1919, Clay, Lowndes, and Monroe Counties produced 10,478 acres. Five years later these same counties produced only 945 acres. This indicates that something drastic had happened and alfalfa almost passed out of the agricultural picture.

### Alfalfa Requires High Fertility

Alfalfa is a plant that will not tolerate a wide range in soil fertility, and the fertility level of soils can be generally estimated by knowing whether or not the crop will grow on them. The chemical composition of alfalfa hay is shown in Table 2 along with that of some other hays. The mineral content, in general, is high, since alfalfa will grow only on soils high in minerals. The percentage potassium according to these data was 2.3%, or in terms of potash ($K_2O$) this would be approximately 2.80%.

Assuming that four tons of alfalfa hay are produced on an acre of land, enough potash would be removed in one year to be equivalent to approximately 450 pounds of 50% muriate of potash. If the alfalfa was grown for four years on the same land, the potash supply in the soil would be greatly decreased.

The calcium and phosphate contents in this forage are also high and are indicative of the fertility that must be

TABLE 2.—MINERAL CONTENTS OF SOME FORAGE PLANTS[1]

| Crop | % K | % Ca | % P |
|---|---|---|---|
| Alfalfa | 2.37 | 2.45 | .36 |
| Soybeans | 1.25 | 1.05 | .21 |
| Lespedeza | .94 | 1.44 | .31 |
| Redtop | 1.52 | .31 | .25 |
| Johnson Grass[2] | ..... | .76 | .27 |

[1] Data taken from U.S.D.A. Misc. Pub. No. 369. 1941.

[2] Analyzed by Mississippi Experiment Station Chemist.

TABLE 3.—ANNUAL ACRE YIELDS OF AIR-DRY ALFALFA HAY IN TONS PER ACRE PLANTED IN THE SPRING OF 1928[1]

| Treatments | 1928 | 1929 | 1930 | 1931 | 1932 | Average |
|---|---|---|---|---|---|---|
| Check | 0.90 | 1.89 | 0.99 | 2.16 | 2.23 | 1.63 |
| 20 tons stable manure | 2.09 | 3.20 | 1.72 | 3.55 | 3.19 | 2.75 |
| 20 tons stable manure and 500 lbs. superphosphate (16%) | 2.03 | 3.25 | 1.91 | 3.95 | 3.78 | 2.98 |
| 20 tons stable manure and 500 lbs. basic slag | 2.19 | 3.84 | 1.89 | 4.21 | 3.77 | 3.18 |
| 1,000 lbs. superphosphate | 1.29 | 2.81 | 1.15 | 2.68 | 2.78 | 2.14 |
| 1,000 lbs. basic slag | .83 | 2.60 | 1.09 | 2.50 | 2.70 | 1.94 |
| 10 tons of stable manure | 1.91 | 2.87 | 1.36 | 2.85 | 2.76 | 2.35 |

[1] Data taken from U.S.D.A. Tech. Bul. No. 419. 1934.

delivered by a soil in order to produce good alfalfa. The mineral contents of soybeans, lespedeza, and red top are considerably less than that in alfalfa. Consequently, they will grow on soils relatively low in fertility.

### Decline in Acreage

Many of prairie-like soils of Mississippi were once very fertile and before accelerated erosion had wrought such a toll of the land, they were fairly deep. One farmer reported that he grew alfalfa for a number of years, but finally a hard layer was formed in the soil and the crop failed to grow because the roots could not penetrate the hardpan. Another reported that Johnson grass invaded his alfalfa field and destroyed the stand. The common report was that a strange disease was destroying the crop.

These testimonies pointed toward the fertility of the soils which had been decreased by soil erosion or crop removal and leaching to a point below the alfalfa standard. Many of the once dark-colored fertile fields are now barren lime rock as a result of man-induced sheet erosion. Alfalfa is a deep-rooted plant that requires a deep soil in addition to a high fertility level. Figure 1 shows results of erosion in this area.

In order to answer the question of why alfalfa refused to grow in the various counties of Mississippi where it had once grown well, a branch experiment station was established near West Point, Mississippi, in 1925 to study the problem. Some data gathered by this branch station are given in Tables 3 and 4. The data from this study indicate definitely that soil fer-

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TABLE 4.—ANNUAL YIELDS OF ALFALFA HAY IN TONS PER ACRE PLANTED IN SPRING OF 1926[1]

| Treatments | 1926 | 1927 | 1928 | 1929 | Over |
|---|---|---|---|---|---|
| No treatments | 0.23 | 1.97 | 1.13 | 0.79 | 1.03 |
| 20 tons stable manure | 0.79 | 4.53 | 3.79 | 3.76 | 3.22 |
| 10 tons stable manure and 500 lbs. superphosphate | 0.65 | 4.54 | 4.39 | 3.55 | 3.28 |
| 500 lbs. superphosphate | 0.37 | 3.46 | 3.02 | 1.96 | 2.20 |
| 1,000 lbs. basic slag | 0.40 | 4.02 | 2.85 | 2.25 | 2.38 |
| 2 tons ground limestone | 0.40 | 2.63 | 1.62 | 1.29 | 1.49 |

[1] Data taken from U.S.D.A. Tech. Bul. No. 419. 1934.

# Soil Conservation Districts and District Supervisors in South Carolina

(An address by E. C. McArthur, President, at annual meeting of the South Carolina Association of Soil Conservation District Supervisors, Columbia, S. C., January 18, 1946.)

GROWTH and progress are the results of functioning. The harder the conflict, the more glorious the triumph. Having experienced conflict and tasted victory, I feel that it is appropriate to discuss accomplishments of soil conservation district supervisors and progress made in soil conservation districts since the passage of the Soil Conservation Districts Law in 1937, and, particularly, since the organization of this Association in 1940.

In claiming accomplishments for soil conservation district supervisors and progress of districts, I wish to give full consideration to the very able assistance we have had in carrying on affairs of soil conservation districts.

First, I point to the South Carolina Soil Conservation Committee which has worked with supervisors in organizing districts and in helping us to understand the Law and our own duties and responsibilities. In helping to develop supervisors, the Soil Conservation Committee has developed itself; it has a fuller conception of the Soil Conservation Districts Law, the purpose of soil conservation districts, and the need for coordinating efforts of agricultural workers and every citizen in helping farmers to solve their farming problems. A booklet entitled, "Soil Conservation Districts in South Carolina," compiled by the State Committee, bears me out in this statement. This booklet has furnished valuable information to citizens as to the eroded condition of our soil and the purpose of districts to save it.

The Extension Service has performed a much needed service to farmers by acquainting them with the district purpose, duties of supervisors, services they may obtain through districts, services they, themselves, may render other farmers, and crops with which to maintain and improve the fertility of our soil.

Soil Conservation Service has cooperated with supervisors in helping farmers of the districts by making soil surveys to determine the type of soil to be dealt with on each farm; in assisting farmers plan their farms in order that each acre may be put to its best use; in selecting the crops most suitable to the needs of the farm family and to the soil; and in bringing back into profitable production idle lands that were, each year, becoming more of a burden and a threat to each farm. Approximately 12,000 farms have been planned to date, covering approximately two million acres.

### Cooperation

County Agents have assisted district supervisors in holding meetings and in many other ways have helped supervisors to perform their duties. Also, agricultural teachers, Farm Security Administration, AAA, Production Credit Association, our state colleges, the State Department of Education, Bankers Association, individual bankers, farm machinery dealers, civic groups, newspapers, business men, educators, Farmers' Organizations, Farm Bureaus with Mr. E. H. Agnew as leader, The Grange,

S. C. Agriculture Commissioner Jones, S. C. Agricultural and Industrial Commission, and individual citizens have helped soil conservation district supervisors to do the job. And while we are about it, let us not forget to mention Future Farmers of America and 4-H Club groups who have rendered farmers worthy service through soil conservation districts.

Believing the philosophy of the Soil Conservation Districts Law will do much to bring each farmer into the agricultural picture, give him a broader view and deeper understanding of the need for soil conservation, as well as a deeper interest in cooperating with other farmers to achieve soil conservation, thus making democracy work, supervisors have bent their energies to spread that philosophy to farmers. Soil Conservation District Supervisors realize the need for saving the soil, our basic economic resource, but we believe it is of more importance to rehabilitate a human being than an eroded farm. However, knowing that the two go hand-in-hand, we have come to believe that our greatest accomplishment has resulted from the assistance we have been to the small farmer in establishing himself and his farm on a sound basis. May I tell you of a few of these instances?

### Proof of Aid

A lady in Anderson County found herself, upon the death of her husband, with several children to educate and a run-down, eroded farm as her chief source of income. Necessity and the will to do caused this lady to attempt to fulfill her responsibility to her family with what she had at hand. District Supervisors and agricultural workers willingly came to her rescue and the living testimonies of educated children confirm what has been said and written about conservation practices paving the way for increased production and farm incomes.

A man bought a farm in 1940 in Chester County, requested a plan on it in 1942, and began putting conservation practices on his ground in 1943. The farm was purchased for $5,100 and appraised by F. S. A. in 1945 at $8,500. His income in 1943 was $1,580.00; in 1944, $2,600.00; and in 1945, $3,500.00. He says, "The future looks bright."

An illiterate farmer in Marion County started conservation farming in 1943. Skeptical neighbors poked fun at him for his crazy farming, but stopped when the red spots on the sloping land disappeared and changed to large stacks of lespedeza hay. This man said, "My boys won't grow up without no education. They are going to school and these new things you fellows are helping me with will see to that, too."

Horry Soil Conservation District has played an important part in the life of a small farmer near Conway. Increased quantity and quality of tobacco, he attributes to crotalaria preceding the tobacco. Much idle land has been brought back into production with a good drainage system. This cooperator is very pleased to have the added income to apply to taxes and other obligations.

A negro farmer in Lee County grins broadly as he tells of increasing his corn yield from 6 to 15 bushels by using conservation methods. Another negro farmer in that county praises his district plan and the supervisors of Lynches River Soil Conservation District. He says, "When the plan was written, I owed $500. I still owe $400, but have bought and paid for a separate tract of 27 acres—all in three years' time."

There is a young man in Greenville County whose plans to become a doctor were frustrated by the death of his father. Sick at heart, he took over the farm which was fast becoming a problem because of accelerated erosion caused by misuse of the land. Through the district channel, this young man received so much assistance from all cooperating agencies that a new vista of life opened to him and as he latched on to improved farming methods and saw increased yields, increased income, and increased value of his farm as a result, he became proud of the job he

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**A demonstration of tissue tests on the farm of J. R. Renick, Logan County, Ohio, during the growing season of 1945.**

# Plow-Under Fertilizer Ups Corn Yields

*By E. P. Reed and F. J. Salter*

Department of Agronomy, Ohio State University, Columbus, Ohio

CORN is distinctly an American crop, for in the history of all other countries we do not find records of corn until after the discovery of America.

Corn-growing practices from the earliest days, when the Indian squaw used a crooked stick as a cultivating tool and one fish in the hill for fertilizer, have undergone remarkable changes up to the present-day use of mechanized tillage and harvesting equipment, the application of larger amounts of fertilizer both in the row and furrow bottom, and the planting of carefully bred adapted hybrids.

The up-to-date corn grower believes that the observance of a five-point program is necessary to produce high corn yields, such as:

1. An adequately drained soil well stocked with organic matter.
2. Ample fertilization with nitrogen, phosphorus, and potash so placed in the soil as to give maximum availability of nutrients throughout the growing season.
3. The planting of the best adapted hybrids at or near the optimum date.
4. Adjusting the planting rate to the productivity level of the soil, including its fertility treatments.
5. Timeliness and adequacy of all tillage operations.

## Development and Changes in Method of Fertilizer Application

Twenty-five years ago the favorite fertilizer for corn was manure supple-

mented with a broadcast application of superphosphate. When manure was not available, a complete fertilizer was broadcast. Studies by a number of experiment stations in the Corn Belt indicated that fertilizers placed in the hill or row led to rapid development of the corn plant in its early growth and hence earlier maturity. Such treatments were considered to supplement the broadcast applications of manure or fertilizers or both and not to take the place of them. It was soon found that many of the planter attachments placed most of the fertilizer in contact with the seed. This method, especially with heavier rates of application, resulted in reducing the stands from 20 to 50 per cent, thus offsetting the expected benefits of localized fertilizer placement.

In the early 1930's manufacturers rapidly developed improved fertilizer distributors, and additional field studies showed that the total amount and grade of fertilizer could be safely placed in the hill or row. This method of fertilization proved highly satisfactory as long as we were satisfied with yields of 70 to 80 bushels per acre on most of our best corn soils. It was observed, however, that the benefits of such placements of fertilizer fluctuated with the type of season. In dry years yield increases were negligible while good results came with years of average to abundant rainfall. Dry conditions rendered the fertilizer inactive for a considerable time due to shallow placement. This brought about studies of methods of applying the fertilizer to obviate these periods of inaction of the fertilizer. The desires to push yields to higher levels also came in with the use of corn hybrids and their greater response to higher fertility conditions. Plow-under fertilizer placement offered a solution to these problems. In this fashion heavier applications could be made safely and the fertilizer was in a moist soil at all times. The report which follows is part of the study of this effort to get maximum yields.

### Field History and Plan of Demonstration

The objective of these demonstrations was to determine the effect of thicker rates of planting and heavier fertilizer applications on the yield and quality of corn grain. These demonstrations were conducted under average

**Weighing corn from the Arthur Morton plots, Preble County, Ohio—center, check plots—left, nitrogen alone—right, 8-8-8 plots.**

farm field conditions on the various soil types found in the State.

Six hundred pounds of 8-8-8 per acre plowed under in bands on the furrow bottom were compared with 250 pounds of ammonium sulphate per acre and with no plow-under fertilizer. All three plots received uniform hill or row applications of fertilizer.

Two rates of planting were made on each plot receiving different fertilizer treatment. One-half of the area was planted to the lighter rate, 3 kernels per hill, and the other half to the heavier rate, 4 kernels per hill, or the equivalent rates in drilled corn of 14-inch and 10-inch kernel spacing in the row. With expected losses from various causes, the resulting stands would approximate an average of 10,000 plants and 13,000 plants per acre, respectively.

The corn hybrid planted on the demonstration plots was the same as that planted in the remainder of the field. All the hybrids grown were adapted to the area and were selected by the cooperating farmers.

A field history was secured for each demonstration. This record included soil type and analysis, crops grown, and the lime, fertilizer, and manure applications for the past three years. The immediately preceding crops in all of the demonstrations ranged from corn (27 per cent), timothy sod (7 per cent), small grains and soybeans (10 per cent each), alfalfa-clover-timothy and sweet clover sods (47 per cent) to one field of manured alfalfa-clover-timothy sods.

The soil types on which the corn was grown were in the early and late Wisconsin glacial drift and the lake plain area. They were about equally divided between light colored silt, sand, and silty clay loams and the dark colored heavy soils of clay, clay loam, and silty clay loam texture.

### Plant Tissue Tests

The tissue tests for nitrates, phosphate, and potash were made at the early tassel stage on the heavy plantings of all plots. A summary of these findings is in the following table:

TABLE 1.—TESTS, EXTENDING FROM JULY 23 TO AUG. 3, 1945

| Fertilizer Lbs. Acre<br>Row: 229# single strength<br>Plow under: 600# 8–8–8<br>Plow under: 250# Am. Sul. | Nitrates % Showing | | | Phosphate % Showing | | | Potash % Showing | | |
|---|---|---|---|---|---|---|---|---|---|
| | High | Med. | Low | High | Med. | Low | High | Med. | Low |
| Row only | 25 | 27 | 48 | 67 | 25 | 8 | 65 | 26 | 9 |
| Row + 8–8–8 | 60 | 18 | 22 | 83 | 10 | 7 | 70 | 19 | 11 |
| Row + Am. Sul. | 68 | 25 | 7 | 80 | 13 | 7 | 66 | 28 | 6 |

*Comments and Conclusions Based on These One-Year Tests*

1. The check or row-fertilized plots show a low available supply of nitrates as compared to phosphate and potash.
2. The nitrates are lower than phosphate and potash even on the 8-8-8 and nitrogen-treated plots.
3. The potash is lower than the phosphate on both the 8-8-8 and nitrogen-treated plots, showing the need for added potash.
4. Many of the high tests at this stage of the plant's growth will be lowered as the corn ear develops and matures.
5. When nitrates become limiting factors in plant tissue development, the limited growth leads to accumulations of unused phosphate and potash.

### Comparative Yield Evidence

In an attempt to further evaluate the practice of applying large amounts of fertilizer in bands in the plow furrow bottom for increased corn production, 17 growers in western Ohio cooperated in the program in 1944 and 33 in 1945.

Unfortunately, due to extreme drought conditions in 1944 and exces-

sive rains in early June in 1945, the stands of corn and uniformity of plant growth were seriously affected. This condition, in addition to difficulty or failure to properly adjust the fertilizer distributor to apply the required amounts of fertilizer, eliminated 9 of the 17 tests in 1944 and 13 of the 33 trials in 1945. Therefore, the yield results in the following tables are for 8 trials in 1944 and 20 trials in 1945.

## Summarized Statement of Conclusions Based on 1944 and 1945 Results

1. Hill or row applications of fertilizer alone are not adequate for maximum yields.

2. Row fertilizer plus nitrogen alone plowed under has resulted in yield increases approximately the same as from

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TABLE 2.—PLOWING UNDER FERTILIZER FOR CORN DEMONSTRATION—1944

Plants per Acre and Yield in Bushels of Shelled Corn per Acre at 15½% Moisture

| Soil Type | Light Planting Rate | | | | | | Heavy Planting Rate | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Fertilizer Treatment | | | | | | | | | | | |
| | Row | | Row+8-8-8 | | Row+Nitrogen | | Row | | Row+8-8-8 | | Row+Nitrogen | |
| | Plants | Yield | Plants | Yield | Plants | Yield | Plants | Yield | Plants | Yield | Plants | Yield |
| Brookston | 9272 | 69.3 | 9764 | 73.7 | 10644 | 71.5 | 10781 | 56.9 | 11624 | 65.2 | 12016 | 74.0 |
| Brookston | 8939 | 50.0 | 9801 | 63.0 | 9723 | 61.6 | 11488 | 55.0 | 11761 | 59.6 | 10977 | 60.7 |
| Brookston | 8690 | 55.8 | 8646 | 71.4 | 8998 | 60.6 | 11088 | 62.8 | 10934 | 65.5 | 11264 | 70.4 |
| Pandora | 11729 | 96.6 | 11837 | 99.1 | 11837 | 101.5 | 15313 | 85.0 | 15964 | 96.6 | 14335 | 104.1 |
| Brookston | 10095 | 83.7 | 10683 | 93.7 | 11075 | 94.4 | 19210 | 54.0 | 18720 | 73.1 | 19406 | 71.7 |
| Brookston | 12100 | 64.4 | 12221 | 98.0 | 11979 | 100.3 | 14278 | 74.2 | 14278 | 92.8 | 15004 | 94.3 |
| Average | 9805 | 69.8 | 10492 | 83.2 | 10709 | 81.6 | 13693 | 64.6 | 13846 | 75.5 | 13833 | 79.2 |
| Russell | 8300 | 65.9 | 9600 | 92.5 | 9300 | 88.3 | 11600 | 75.5 | 12200 | 88.4 | 12200 | 88.6 |
| Crosby | 8233 | 56.8 | 8625 | 59.6 | 8625 | 62.1 | 12349 | 52.2 | 13043 | 69.3 | 13043 | 68.9 |
| Grand Average | 9545 | 67.8 | 10147 | 81.1 | 10271 | 80.0 | 13263 | 64.4 | 13540 | 76.4 | 13530 | 79.1 |
| Average increase over check | | | | 13.3 | | 12.2 | | | | 12.0 | | 14.7 |

TABLE 2A.—THE EFFECT OF TREATMENT ON YIELD—1944

| Planting Rate | Treatment, Yield, and Increases in Bushels per Acre | | | | |
|---|---|---|---|---|---|
| | Row Only | Row+8-8-8 | | Row+Nitrogen | |
| Plants per Acre | Yield | Yield | Increase | Yield | Increase |
| 8,000 to 10,000 | 59.6 | 72.1 | 12.5 | 68.2 | 8.6 |
| 10,001 to 12,000 | 71.8 | 76.8 | 5.0 | 83.1 | 11.3 |
| 12,001 and over | 66.0 | 86.4 | 20.4 | 83.6 | 17.6 |

TABLE 2B.—THE EFFECT OF RATE OF PLANTING ON YIELD—1944

| Treatment | Rate of Planting, Yield, and Increases in Bushels per Acre | | | | |
|---|---|---|---|---|---|
| | Plants/Acre | Plants/Acre | | Plants/Acre | |
| | 8,000–10,000 | 10,001 to 12,000 | | 12,001 and over | |
| | Yield | Yield | Increase | Yield | Increase |
| Row only | 59.6 | 71.8 | 12.2 | 66.0 | 6.4 |
| Row+8-8-8 | 72.1 | 76.8 | 4.7 | 86.4 | 14.3 |
| Row+Nitrogen | 68.2 | 83.1 | 14.9 | 83.6 | 15.4 |

TABLE 2C.—FERTILIZER, RATE OF APPLICATION AND COST PER ACRE—1944

| Fertilizer | Grade | Av. Lbs/Acre | Av. Cost/Acre* |
|---|---|---|---|
| Row only | Single Strength | 222 | $3.37 |
| Plow Under | 8-8-8 | 600 | $12.04 |
| Plow Under | Am. Sul. | 250 | $4.83 |

* 1944 Spring Cash Price.

**Fig. 1.—Sweet clover growing on land treated with crop residues, lime, phosphate, and potash. Spring growth on a southern Illinois experiment field near Newton.**

# Potash Treatment Makes Better Sweet Clover

*By H. J. Snider*

Soil Experiment Fields, University of Illinois, Urbana, Illinois

SWEET CLOVER is a vigorously growing plant, but is sensitive to shortages of fertility elements in soils. Such soil deficiencies may affect the development of the plant and in addition may influence the nitrogen and mineral content of the crop. Sweet clover may be observed growing rather luxuriantly along road-sides, in gravel pits, and in other similar locations usually not associated with productive soils. This habit of growth may lead to the conclusion that this legume may not be seriously affected by the lack of suitable fertility balance in soils where it grows.

Sweet clover is widely accepted as a desirable legume for soil improvement mainly because of its heavy growth, adaptability to various nurse crops, and its ability to withstand adverse weather conditions. Wherever sweet clover thrives, it produces a more luxuriant growth than most any other clover and makes this growth relatively early in the season. This large volume of growth is usually very gratifying, considering the several uses of the crop, such as, soil improvement, grazing, hay, silage, seed production, and in some cases a honey crop.

Total growth of sweet clover including both roots and tops may be relatively large, but its value as a soil-building crop and its feeding quality may be seriously affected by unfavorable soil conditions. Biennial white sweet clover grown on highly productive dark-colored soils in some Illinois tests averaged

10,350 pounds of dry roots and tops an acre at full bloom stage. This amount of material was found to contain 239 pounds of total nitrogen in the acre growth. The same type of sweet clover on less productive light-colored soils made a growth amounting to 12,430 pounds of roots and tops which contained in the acre growth only 128 pounds of total nitrogen at full bloom stage. This represents a large difference in nitrogen content of sweet clover grown on these two soils, and a large part of this difference must be attributed to unfavorable conditions in the light-colored soil which apparently hindered nitrogen fixation and nitrogen uptake.

Differences in composition of sweet clover due to soil variation may be further illustrated by results from eight Illinois experiment fields (Table 1). Four of these fields are located on rather highly productive dark-colored soils in central and northern Illinois and four are located on the less productive light-colored soils of southern Illinois. These dark-colored soils had a total nitrogen content which averaged 4,100 pounds in the top soil. These soils were previously limed and had a reaction of pH 6.2 and a replaceable calcium content of 6,000 pounds an acre. The replaceable potassium content of these dark soils averaged 190 pounds an acre. The light-colored soils averaged 2,100 pounds an acre of total nitrogen and had a reaction of pH 6.3 where limestone was added and a replaceable calcium content of 2,800 pounds an acre. The replaceable potassium content of these soils where no potash treatment was applied averaged 80 pounds an acre, an amount which is relatively low for Illinois soils.

Average acre yield and composition of sweet clover tops and roots from both dark-colored and light-colored soils showed beneficial effect of potash applications (Table 1). Since the light-colored soils were quite deficient in available potassium, the acre yield of tops and roots was considerably higher on land where potash treatment was given (RLPK) in comparison to the land where it was withheld (RLP). Acre yield on the light soil was much lower where potash treatment was withheld than was the yield for a similar treatment (RLP) on the dark soils. The acre yield was relatively high on both soils where potash treatment was applied. The light-colored soils apparently had the advantage in larger yield, which was probably due to a slightly longer growing season in the more southern location.

The nitrogen content of sweet clover grown on the four fields located on the

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TABLE 1. YIELD AND COMPOSITION OF SPRING GROWTH OF SWEET CLOVER REPRESENTING TWO LARGE SOIL AREAS IN ILLINOIS.

EACH VALUE IS AN AVERAGE OF RESULTS FROM FOUR EXPERIMENT FIELDS IN THE AREA INDICATED.

| Soil Treatment | Tops Roots lbs./A | N | P | K | Ca | Mg |
|---|---|---|---|---|---|---|
| | | *Pounds per ton* | | | | |
| Dark-colored soils | | | | | | |
| RLP | 1,810 | 87.3 | 6.2 | 25.6 | 16.6 | 9.7 |
| RLPK | 2,040 | 89.4 | 5.6 | 31.6 | 15.4 | 9.1 |
| Light-colored soils | | | | | | |
| RLP | 1,070 | 52.7 | 5.4 | 15.1 | 32.3 | 10.4 |
| RLPK | 2,450 | 41.9 | 5.2 | 25.7 | 29.9 | 9.1 |

Tops and roots were obtained for analysis at time of plowing under for green manure. Plow-under dates ranged from April 20 to May 16.
R—crop residues turned back.
L—limestone
P—phosphorus
K—muriate of potash

# Potash Pays Good Dividends in Louisiana

*By R. A. Wasson*

Department of Agronomy, University of Louisiana, Baton Rouge, Louisiana

JUST a few years ago our corn crop was mostly fertilized with straight nitrogen materials and rarely at rates exceeding 30 pounds of nitrogen per acre. In the light of our present knowledge on the subject of fertilizers for corn, the recommendations are on a per-acre basis—50 to 60 pounds of nitrogen, 30 pounds available phosphoric acid, and 30 pounds available potash. These recommendations apply to all soils except heavy alluvial types. In order to prove the practical value of these recommendations, the agricultural extension service conducted 108 fertilizer result demonstrations in 1945. These demonstrations were carefully supervised throughout and the records, as follows, were most encouraging: The average per-acre yield on all demonstrations was 48.1 bushels; the check plots averaged 32.5 bushels; and the average net increase was 16.6 bushels, or 51 per cent in favor of the recommended fertilizer.

In all cases, 375 pounds of an 8-8-8 mixture per acre were applied prior to planting and 125 pounds of nitrate of soda per acre were applied as a side-dressing when the corn was about six inches high. The check plots, in all cases, were fertilized according to prevailing practices on the farms where the demonstrations were conducted. For the most part these locally used materials consisted of 200 to 300 pounds of a 4-12-4 or 5-10-5 mixture supplemented with from 125 to 150 pounds nitrate of soda per acre as a side-dressing. The fact that the checks were fertilized in this manner emphasized the value of the additional potash used on these demonstrations. When these 108 demonstrations were separated into type-of-soil areas, the results were as follows:

*Upland Coastal Plain (Hill) Soils*

On 76 demonstrations, the average yield on the recommended fertilizer plots was 46.4 bushels per acre. The check plots receiving common, local fertilization averaged 32.4 bushels. The average net gain in favor of the recommended fertilizer was 14.0 bushels per acre or 40.4 per cent.

*Terrace (Bluff) Soils*

Twenty-three demonstrations averaged 44.6 bushels per acre for the recommended fertilizer and 34.4 bushels on the checks. The average net increase of demonstrations over checks was 10.2 bushels or 29.6 per cent.

*Alluvial (River Bottom) Soils*

Nine demonstrations averaged 51.3 bushels per acre. Checks averaged 38.0 bushels. The average increase was 13.3 bushels per acre or 35.0 per cent.

From these demonstrations and other related sources of information, it seems assured that a high-grade, complete fertilizer under corn, as a starter, gives very profitable increases in yields, provided the fertilizer used supplies at least 30 pounds of available phosphoric acid and 30 pounds of available potash per acre. In all cases, the available nitrogen should be brought up to 50 to 60 pounds per acre.

## Cotton

The year 1945 was an extremely unfavorable year for cotton in Louisiana.

(*Turn to page* 46)

# Rich Fog in the Hollows

*By George D. Scarseth*

Director of Research, American Farm Research Association, Lafayette, Indiana

RECENTLY my good friend, G. N. Hoffer, of plant tissue test and potash fame gave me some facts about carbon dioxide that are as startling, interesting, and important in connection with growing crops as penicillin is in curing some diseases. While it is a well-known fact that dry vegetable matter or crop materials contain about 45 per cent carbon, no broad attention has been given to the available supply of this element to our common crops. It is also well known that plants obtain their carbon in the form of the gas, carbon dioxide, which is present in our ordinary air in about .03 per cent and that the plants take in this gas largely through the leaves. Hoffer points out that if a corn crop is to produce 50 bushels of corn per acre the volume of air over the acre that must enter the plants would be equal to a height of over 6,000 feet. Of course, the plant does not use the particular air that is directly above it to this height but uses the air that blows across the fields constantly bringing in a new but very diluted supply.

### Carbon Is the Element of Life

Ordinarily we think of plant requirements in terms of fertilizer nutrient elements, water, and favorable temperatures, but it is quite apparent that the plant may have a very difficult time under some conditions in obtaining an adequate supply of carbon which must be taken in as carbon dioxide. However, nature has provided a marvelous mechanism for releasing carbon dioxide when vegetable or organic matter decays so that the atmosphere may be enriched and plants can continue to grow. Man, animals, plants, and micro-organisms play the leading roles in this great drama. All these give off carbon dioxide in both their life processes of growing when they oxidize or burn carbonaceous materials to carbon dioxide and again in the process of decay after death when the carbon dioxide is further freed from its complex organic compounds that made up the bodies. While plants release carbon dioxide from their roots in growing, they also absorb it through the leaves and convert it in combination with water and other compounds into plant substances. In this case the sun furnishes the energy and we call the process photosynthesis.

In virgin jungles, forests, or prairies the balances between the arresting and freeing of carbon dioxide seem to be a well-balanced proposition. In our farming operations we frequently upset this balance through practices that destroy excessive quantities of organic matter; then it appears we are in for trouble.

Scientists have recently shown that the amount of carbon dioxide released daily from a high-organic prairie soil in Illinois and Iowa is equal to about 1,100 cubic feet or about 38 pounds of carbon. Hoffer points out that this amount is sufficient to meet the carbon requirements of growing plants to produce 80 bushels of corn per acre. This brings up the thought that perhaps on soils that are low in organic matter the amount of carbon dioxide released daily from the soil is not enough along with that which is ordinarily in the air to produce an extra big corn yield even though the supply of nutrient elements and moisture were abundant and ideal.

(*Turn to page* 45)

# PICTORIAL

FRECKLES—ONE OF THE FIRST CROPS TO SHOW IN THE SPRING.

**Above:** The possibility of more farm ponds is now receiving much attention. They not only furnish fish for better diets, but opportunities for wholesome recreation.

**Below:** On the farm of Lewis Clark, White County, Indiana, the fertiliser being poured into this hopper will be applied on the plow sole.

**Above:** Healthy children and healthy farm animals are the mainstay of American agriculture. The 4-H Clubs annually enroll thousands of both.

**Below:** This field of young wheat in Tippecanoe County, Indiana, received 300 lbs. of 3-12-12 fertilizer per acre. Check plot in the foreground received no fertilizer.

**Above: A county agent shows some 4-H Club boys that fertilizer has to be put where it will be handy for the plant.**

**Below: Proof in hand—fertilizer did make a difference—left, fertilized; right, no fertilizer.**

# The Editors Talk

## Recognizing Youth

"All young men and women in the world today face the challenge of unsettled times and new problems—but also of new ideas and great new opportunities." Thus spoke President Truman in a message to all 4-H Club members in the United States early this year. Declaring that the eyes of the young men and women of the world are on the youth of the United States, searching for example, ideas, and ideals, he urged all rural young people to take an active part in their own local 4-H Club program in 1946 and in years following. "This is one of the ways," he said, "in which we can build the kind of youth the United States needs—strong, skilled, informed, and articulate—and it is one of the important means we have of demonstrating to the world what youth can accomplish through practical democracy and good citizenship."

During the past several years our agricultural colleges and experiment stations have worked tirelessly in bringing the science of agriculture to our rural youth, both by demonstration and literature. A recent illustration of the extent of this recognition of youth and the cooperation involved in providing them with understandable information is seen in a new circular, No. 4H-48, published in October 1945 by the Wisconsin College of Agriculture under the title "My Story: Growing Potatoes as a 4-H Project." It was planned for the use of boys and girls in Wisconsin club work; however, because the information is up-to-the-minute scientifically and includes some of the standard practices of experienced potato men, it may be read by some of the elders as well.

The circular is profusely illustrated, and two of the photographs are reproduced on the opposite page in this issue. The story tells in the first person how one boy became interested in growing potatoes as a profession, but first decided to learn the fundamentals in club work. He was aided by his parents, by his county agent, the club leader, and by neighbors and friends in learning his business.

The scene is laid in Waupaca county, Wisconsin, where the county agent is Victor Quick. The boy, named Jim, is a son of the Pomerening family living near New London on a dairy farm. Others in the family are Cal, an older brother, and Faith, the little sister. Harold Gretzmacher, a neighbor boy, also takes part in the story. The pictures tell the story of the project from start to finish and include illustrations of potato diseases and potato pests.

The picture of the family home "Breezy Hill" was painted in water color by Byron C. Jorns, Wisconsin water color artist, who is illustrator for the publications of the Wisconsin College of Agriculture. Mr. Jorns also designed and painted the unusual cover of the circular and planned the groupings of the pictures. The water color of the home now hangs in the Pomerening parlor.

The subject matter for the circular was prepared and approved by potato specialists and research men of the College of Agriculture, including J. G. Milward,

veteran potato man of the State; G. H. Rieman, H. Darling, T. C. Allen, K. C. Berger, J. W. Brann, R. E. Vaughan, and V. H. Quick. The 4-H Club Department, assisted by Miss Grace Langdon of the Department of Agricultural Journalism, put the material into the simple, narrative style suited to the use of club young people. Photographs for the circular were specially taken by Homer Montague, university photographer.

The booklet will be used by 4-H Club members throughout the State as a text in their work in potato growing this year. It is being sent to all agricultural extension editors by Lester Schlup, Chief of the Division of Extension Information, U. S. Department of Agriculture, as an example of a new approach to 4-H Club literature.

We have a fine youth in America—the finest in the world. It is such faith in and recognition of it by our men of science and experience as detailed above which make the eyes of the young men and women of the world turn to the youth of the United States, "searching for example, ideas, and ideals."

## Carbon Dioxide—A Plant Nutrient

In connection with the increasing interest in soil aeration as a necessary consideration in optimum plant growth, more attention may be given to the supply of carbon dioxide available to the plant. It might be thought that with the large supply in the air, carbon dioxide would be one factor which would not cause worry in crop yields.

The article by G. D. Scarseth appearing on page 26 of this issue quotes observations by G. N. Hoffer on the magnitude of the carbon dioxide requirement of the crop in relation to the amount available in the air over the crop. Carrying the observations further, it was pointed out that carbon dioxide produced in the soil may be a factor in crop growth and that some of the practices designed to improve organic matter relationships in the soil may have had at least part of their value in their fostering carbon dioxide production.

Discussing the atomic constitution of corn plants, Dr. Hoffer calculated that approximately 45% of the composition of these plants consisted of carbon; 44% oxygen; 6% hydrogen; 1.5% nitrogen; 0.9% potassium; 0.2% of phosphorus, calcium, magnesium, and sulphur. Other elements such as iron, manganese, and boron are in lesser amounts.

In order to produce carbon dioxide in the soil as the result of the decomposition of organic matter, oxygen is needed and at least a good part of this will have to come from the soil air. Here is another important function that soil aeration serves in the growing of crops.

It was suggested that the carbon dioxide in muck soils may account for the excellent crop responses to fertilizers applied to these soils. Similar crops fertilized in mineral soils with lesser amounts of organic matter do not produce the quality obtained in muck. All green plants, including forests and weeds compete for carbon dioxide in the air. It is also dissolved in rain and all bodies of water. Hence it seems as if the crops grown in well-aerated soils rich in active organic matter should be directly benefited. In any event, fertilizers are most effective under such conditions.

## Season Average Prices Received by Farmers for Specified Commodities *

| Crop Year | Cotton Cents per lb. | Tobacco Cents per lb. | Potatoes Cents per bu. | Sweet Potatoes Cents per bu. | Corn Cents per bu. | Wheat Cents per bu. | Hay Dollars per ton | Cottonseed Dollars per ton | Truck Crops |
|---|---|---|---|---|---|---|---|---|---|
| | Aug.-July | ..... | July-June | July-June | Oct.-Sept. | July-June | July-June | July-June | .... |
| Av. Aug. 1909–July 1914.... | 12.4 | 10.0 | 69.7 | 87.8 | 64.2 | 88.4 | 11.87 | 22.55 | .... |
| 1920..... | 15.9 | 17.3 | 125.3 | 141.7 | 61.8 | 182.6 | 16.46 | 25.65 | .... |
| 1921..... | 17.0 | 19.5 | 113.3 | 113.1 | 52.3 | 103.0 | 11.63 | 29.14 | .... |
| 1922..... | 22.9 | 22.8 | 65.9 | 100.4 | 74.5 | 96.6 | 11.64 | 30.42 | .... |
| 1923..... | 28.7 | 19.0 | 92.5 | 120.6 | 82.5 | 92.6 | 13.08 | 41.23 | .... |
| 1924..... | 22.9 | 19.0 | 68.6 | 149.6 | 106.3 | 124.7 | 12.66 | 33.25 | .... |
| 1925..... | 19.6 | 16.8 | 170.5 | 165.1 | 69.9 | 143.7 | 12.77 | 31.59 | .... |
| 1926..... | 12.5 | 17.9 | 131.4 | 117.4 | 74.5 | 121.7 | 13.24 | 22.04 | .... |
| 1927..... | 20.2 | 20.7 | 101.9 | 109.0 | 85.0 | 119.0 | 10.29 | 34.83 | .... |
| 1928..... | 18.0 | 20.0 | 53.2 | 118.0 | 84.0 | 99.8 | 11.22 | 34.17 | .... |
| 1929..... | 16.8 | 18.3 | 131.6 | 117.1 | 79.9 | 103.6 | 10.90 | 30.92 | .... |
| 1930..... | 9.5 | 12.8 | 91.2 | 108.1 | 59.8 | 67.1 | 11.06 | 22.04 | .... |
| 1931..... | 5.7 | 8.2 | 46.0 | 72.6 | 32.0 | 39.0 | 8.69 | 8.97 | .... |
| 1932..... | 6.5 | 10.5 | 38.0 | 54.2 | 31.9 | 38.2 | 6.20 | 10.33 | .... |
| 1933..... | 10.2 | 13.0 | 82.4 | 69.4 | 52.2 | 74.4 | 8.09 | 12.88 | .... |
| 1934..... | 12.4 | 21.3 | 44.6 | 79.8 | 81.5 | 84.8 | 13.20 | 33.00 | .... |
| 1935..... | 11.1 | 18.4 | 59.3 | 70.3 | 65.5 | 83.2 | 7.52 | 30.54 | .... |
| 1936..... | 12.4 | 23.6 | 114.2 | 92.9 | 104.4 | 102.5 | 11.20 | 33.36 | .... |
| 1937..... | 8.4 | 20.4 | 52.9 | 82.0 | 51.8 | 96.2 | 8.74 | 19.51 | .... |
| 1938..... | 8.6 | 19.6 | 55.7 | 73.0 | 48.6 | 56.2 | 6.78 | 21.79 | .... |
| 1939..... | 9.1 | 15.4 | 69.7 | 74.9 | 56.8 | 69.1 | 7.94 | 21.17 | .... |
| 1940..... | 9.9 | 16.0 | 54.1 | 85.5 | 61.8 | 68.2 | 7.58 | 21.73 | .... |
| 1941..... | 17.0 | 26.4 | 80.7 | 94.0 | 75.1 | 94.5 | 9.67 | 47.65 | .... |
| 1942..... | 19.0 | 36.9 | 117.0 | 119.0 | 91.7 | 109.8 | 10.80 | 45.61 | .... |
| 1943..... | 19.9 | 40.5 | 131.0 | 204.0 | 112.0 | 136.0 | 14.80 | 52.10 | .... |
| 1944..... | 20.7 | 40.8 | 149.0 | 192.0 | 109.0 | 141.0 | 16.40 | 52.70 | .... |
| 1945 | | | | | | | | | |
| March..... | 20.24 | 21.4 | 171.0 | 207.0 | 107.0 | 148.0 | 18.10 | 52.00 | .... |
| April..... | 20.20 | 21.4 | 174.0 | 211.0 | 107.0 | 149.0 | 16.90 | 51.90 | .... |
| May..... | 20.51 | 42.2 | 177.0 | 214.0 | 108.0 | 149.0 | 16.50 | 52.10 | .... |
| June..... | 20.90 | 51.2 | 180.0 | 220.0 | 111.0 | 150.0 | 15.90 | 52.50 | .... |
| July..... | 21.25 | 56.3 | 183.0 | 230.0 | 112.0 | 146.0 | 15.40 | 55.00 | .... |
| August..... | 21.33 | 44.9 | 167.0 | 256.0 | 113.0 | 145.0 | 14.60 | 52.50 | .... |
| September... | 21.72 | 43.2 | 138.0 | 207.0 | 112.0 | 145.0 | 14.30 | 51.40 | .... |
| October..... | 22.30 | 45.9 | 126.0 | 180.0 | 113.0 | 151.0 | 14.30 | 51.00 | .... |
| November... | 22.52 | 46.7 | 131.0 | 186.0 | 111.0 | 153.0 | 14.90 | 51.30 | .... |
| December.... | 22.84 | 43.8 | 137.0 | 194.0 | 109.0 | 154.0 | 15.40 | 51.40 | .... |
| 1946 | | | | | | | | | |
| January..... | 22.36 | 36.3 | 145.0 | 208.0 | 110.0 | 154.0 | 15.70 | 50.90 | .... |
| February..... | 23.01 | 33.9 | 146.0 | 223.0 | 111.0 | 155.0 | 15.80 | 50.30 | .... |
| March..... | 22.70 | 31.9 | 157.0 | 236.0 | 114.0 | 158.0 | 16.30 | 47.50 | .... |
| | **Index Numbers (Aug. 1909—July 1914 = 100)** | | | | | | | | |
| 1920..... | 128 | 173 | 180 | 161 | 96 | 207 | 139 | 114 | .... |
| 1921..... | 137 | 195 | 163 | 129 | 81 | 117 | 98 | 129 | .... |
| 1922..... | 185 | 228 | 95 | 114 | 116 | 109 | 98 | 135 | .... |
| 1923..... | 231 | 190 | 133 | 137 | 129 | 105 | 110 | 183 | .... |
| 1924..... | 185 | 190 | 98 | 170 | 166 | 141 | 107 | 147 | 143 |
| 1925..... | 158 | 168 | 245 | 188 | 109 | 163 | 108 | 140 | 143 |
| 1926..... | 101 | 179 | 189 | 134 | 116 | 138 | 112 | 98 | 139 |
| 1927..... | 163 | 207 | 146 | 124 | 132 | 135 | 87 | 154 | 127 |
| 1928..... | 145 | 200 | 76 | 134 | 131 | 113 | 95 | 152 | 154 |
| 1929..... | 135 | 183 | 189 | 133 | 124 | 117 | 92 | 137 | 137 |
| 1930..... | 77 | 128 | 131 | 123 | 93 | 76 | 93 | 98 | 129 |
| 1931..... | 46 | 82 | 66 | 83 | 50 | 44 | 73 | 40 | 115 |
| 1932..... | 52 | 105 | 55 | 62 | 50 | 43 | 52 | 46 | 102 |
| 1933..... | 82 | 130 | 118 | 79 | 81 | 84 | 68 | 57 | 91 |
| 1934..... | 100 | 213 | 64 | 91 | 127 | 96 | 111 | 146 | 95 |
| 1935..... | 90 | 184 | 85 | 80 | 102 | 94 | 63 | 135 | 119 |
| 1936..... | 100 | 236 | 164 | 106 | 163 | 116 | 94 | 148 | 104 |
| 1937..... | 68 | 204 | 76 | 93 | 81 | 109 | 74 | 87 | 110 |
| 1938..... | 69 | 196 | 80 | 83 | 76 | 64 | 57 | 97 | 88 |
| 1939..... | 73 | 154 | 100 | 85 | 88 | 78 | 67 | 94 | 91 |
| 1940..... | 80 | 160 | 78 | 97 | 96 | 77 | 64 | 96 | 111 |
| 1941..... | 137 | 264 | 116 | 107 | 117 | 107 | 81 | 211 | 129 |
| 1942..... | 153 | 369 | 168 | 136 | 143 | 124 | 91 | 202 | 163 |
| 1943..... | 160 | 405 | 188 | 232 | 174 | 154 | 125 | 231 | 245 |
| 1944..... | 167 | 408 | 214 | 219 | 170 | 160 | 138 | 234 | 212 |
| 1945 | | | | | | | | | |
| March..... | 163 | 214 | 245 | 236 | 167 | 167 | 152 | 231 | 203 |
| April..... | 163 | 214 | 250 | 240 | 167 | 169 | 142 | 230 | 259 |
| May..... | 165 | 422 | 254 | 244 | 168 | 169 | 139 | 231 | 193 |
| June..... | 169 | 512 | 258 | 251 | 173 | 170 | 134 | 233 | 269 |
| July..... | 171 | 563 | 263 | 262 | 174 | 165 | 130 | 244 | 244 |
| August..... | 172 | 449 | 240 | 292 | 176 | 164 | 123 | 233 | 240 |
| September... | 175 | 432 | 198 | 236 | 174 | 164 | 120 | 228 | 159 |
| October..... | 180 | 459 | 181 | 205 | 176 | 171 | 120 | 226 | 181 |
| November.... | 182 | 467 | 188 | 212 | 173 | 173 | 126 | 227 | 235 |
| December.... | 184 | 438 | 197 | 221 | 170 | 174 | 130 | 228 | 223 |
| 1946 | | | | | | | | | |
| January..... | 180 | 363 | 208 | 237 | 171 | 174 | 132 | 226 | 249 |
| February..... | 186 | 339 | 209 | 254 | 173 | 175 | 133 | 223 | 275 |
| March..... | 183 | 319 | 225 | 269 | 178 | 179 | 137 | 211 | 283 |

## Wholesale Prices of Ammoniates

| | Nitrate of soda per unit N bulk | Sulphate of ammonia bulk per unit N | Cottonseed meal S. E. Mills per unit N | Fish scrap, dried 11–12% ammonia, 15% bone phosphate, f.o.b. factory, bulk per unit N | Fish scrap, wet acidulated 6% ammonia, 3% bone phosphate, f.o.b. factory, bulk per unit N | Tankage 11% ammonia, 15% bone phosphate, f.o.b. Chicago, bulk, per unit N | High grade ground blood, 16–17% ammonia Chicago, bulk, per unit N |
|---|---|---|---|---|---|---|---|
| 1910–14 | $2.68 | $2.85 | $3.50 | $3.53 | $3.05 | $3.37 | $3.52 |
| 1922 | 3.04 | 2.58 | 6.07 | 4.66 | 3.54 | 4.75 | 4.99 |
| 1923 | 3.02 | 2.90 | 6.19 | 4.83 | 4.25 | 4.59 | 5.16 |
| 1924 | 2.99 | 2.44 | 5.87 | 5.02 | 4.41 | 3.60 | 4.25 |
| 1925 | 3.11 | 2.47 | 5.41 | 5.34 | 4.70 | 3.97 | 4.75 |
| 1926 | 3.06 | 2.41 | 4.40 | 4.95 | 4.15 | 4.36 | 4.90 |
| 1927 | 3.01 | 2.26 | 5.07 | 5.87 | 4.35 | 4.32 | 5.70 |
| 1928 | 2.67 | 2.30 | 7.06 | 6.63 | 5.28 | 4.92 | 6.00 |
| 1929 | 2.57 | 2.04 | 5.64 | 5.00 | 4.69 | 4.61 | 5.72 |
| 1930 | 2.47 | 1.81 | 4.78 | 4.96 | 4.15 | 3.79 | 4.58 |
| 1931 | 2.34 | 1.46 | 3.10 | 3.95 | 3.33 | 2.11 | .46 |
| 1932 | 1.87 | 1.04 | 2.18 | 2.18 | 1.82 | 1.21 | 1.36 |
| 1933 | 1.52 | 1.12 | 2.95 | 2.86 | 2.58 | 2.06 | 2.46 |
| 1934 | 1.52 | 1.20 | 4.46 | 3.15 | 2.84 | 2.67 | 3.27 |
| 1935 | 1.47 | 1.15 | 4.59 | 3.10 | 2.65 | 3.06 | 3.65 |
| 1936 | 1.53 | 1.23 | 4.17 | 3.42 | 2.67 | 3.58 | 4.25 |
| 1937 | 1.63 | 1.32 | 4.91 | 4.66 | 3.65 | 4.04 | 4.80 |
| 1938 | 1.69 | 1.38 | 3.69 | 3.76 | 3.17 | 3.15 | 3.53 |
| 1939 | 1.69 | 1.35 | 4.02 | 4.41 | 3.12 | 3.87 | 3.90 |
| 1940 | 1.69 | 1.36 | 4.64 | 4.36 | 3.35 | 3.33 | 3.39 |
| 1941 | 1.69 | 1.41 | 5.50 | 5.32 | 3.27 | 3.76 | 4.43 |
| 1942 | 1.74 | 1.41 | 6.11 | 5.77 | 3.34 | 5.04 | 6.76 |
| 1943 | 1.75 | 1.42 | 6.30 | 5.77 | 3.34 | 4.86 | 6.62 |
| 1944 | 1.75 | 1.42 | 7.68 | 5.77 | 3.34 | 4.86 | 6.71 |
| 1945 | | | | | | | |
| March | 1.75 | 1.42 | 7.81 | 5.77 | 3.34 | 4.86 | 6.71 |
| April | 1.75 | 1.42 | 7.81 | 5.77 | 3.34 | 4.86 | 6.71 |
| May | 1.75 | 1.42 | 7.81 | 5.77 | 3.34 | 4.86 | 6.71 |
| June | 1.75 | 1.42 | 7.81 | 5.77 | 3.34 | 4.86 | 6.71 |
| July | 1.75 | 1.42 | 7.81 | 5.77 | 3.34 | 4.86 | 6.71 |
| August | 1.75 | 1.42 | 7.81 | 5.77 | 3.34 | 4.86 | 6.71 |
| September | 1.75 | 1.42 | 7.81 | 5.77 | 3.34 | 4.86 | 6.71 |
| October | 1.75 | 1.42 | 7.81 | 5.77 | 3.34 | 4.86 | 6.71 |
| November | 1.75 | 1.42 | 7.81 | 5.77 | 3.34 | 4.86 | 6.71 |
| December | 1.75 | 1.42 | 7.81 | 5.77 | 3.34 | 4.86 | 6.71 |
| 1946 | | | | | | | |
| January | 1.75 | 1.42 | 7.81 | 5.77 | 3.34 | 4.86 | 6.71 |
| February | 1.75 | 1.42 | 7.81 | 5.77 | 3.34 | 4.86 | 6.71 |
| March | 1.75 | 1.42 | 7.81 | 5.77 | 3.34 | 4.86 | 6.71 |
| **Index Numbers (1910-14 = 100)** | | | | | | | |
| 1922 | 113 | 90 | 173 | 132 | 117 | 140 | 142 |
| 1923 | 112 | 102 | 177 | 137 | 140 | 136 | 147 |
| 1924 | 111 | 86 | 168 | 142 | 145 | 107 | 121 |
| 1925 | 115 | 87 | 155 | 151 | 155 | 117 | 135 |
| 1926 | 113 | 84 | 126 | 140 | 146 | 129 | 139 |
| 1927 | 112 | 79 | 145 | 166 | 143 | 128 | 162 |
| 1938 | 100 | 81 | 202 | 188 | 173 | 146 | 170 |
| 1929 | 96 | 72 | 161 | 142 | 154 | 137 | 162 |
| 1930 | 92 | 64 | 137 | 141 | 136 | 12 | 130 |
| 1931 | 88 | 51 | 89 | 112 | 109 | 63 | 70 |
| 1932 | 71 | 36 | 62 | 62 | 60 | 36 | 39 |
| 1933 | 59 | 39 | 84 | 81 | 85 | 97 | 71 |
| 1934 | 59 | 42 | 127 | 89 | 93 | 79 | 93 |
| 1935 | 57 | 40 | 131 | 88 | 87 | 91 | 104 |
| 1936 | 59 | 43 | 119 | 97 | 89 | 106 | 131 |
| 1937 | 61 | 46 | 140 | 132 | 120 | 120 | 122 |
| 1938 | 63 | 48 | 105 | 106 | 104 | 93 | 100 |
| 1939 | 63 | 47 | 115 | 125 | 102 | 115 | 111 |
| 1940 | 63 | 48 | 133 | 124 | 110 | 99 | 96 |
| 1941 | 63 | 49 | 157 | 151 | 107 | 112 | 126 |
| 1942 | 65 | 49 | 175 | 163 | 110 | 150 | 192 |
| 1943 | 65 | 50 | 180 | 163 | 110 | 144 | 189 |
| 1944 | 65 | 50 | 219 | 163 | 110 | 144 | 191 |
| 1945 | | | | | | | |
| March | 65 | 50 | 223 | 163 | 110 | 144 | 191 |
| April | 65 | 50 | 223 | 163 | 110 | 144 | 191 |
| May | 65 | 50 | 223 | 163 | 110 | 144 | 191 |
| June | 65 | 50 | 223 | 163 | 110 | 144 | 191 |
| July | 65 | 50 | 223 | 163 | 110 | 144 | 191 |
| August | 65 | 50 | 223 | 163 | 110 | 144 | 191 |
| September | 65 | 50 | 223 | 163 | 110 | 144 | 191 |
| October | 65 | 50 | 223 | 163 | 110 | 144 | 191 |
| November | 65 | 50 | 223 | 163 | 110 | 144 | 191 |
| December | 65 | 50 | 223 | 163 | 110 | 144 | 191 |
| 1946 | | | | | | | |
| January | 65 | 50 | 223 | 163 | 110 | 144 | 191 |
| February | 65 | 50 | 223 | 163 | 110 | 144 | 191 |
| March | 65 | 50 | 223 | 163 | 110 | 144 | 191 |

## Wholesale Prices of Phosphates and Potash **

| | Superphosphate Baltimore, per unit | Florida land pebble 68% f.o.b. mines, bulk, per ton | Tennessee phosphate rock, 75% f.o.b. mines, bulk, per ton | Muriate of potash bulk, per unit, c.i.f. Atlantic and Gulf ports | Sulphate of potash in bags, per unit, c.i.f. Atlantic and Gulf ports | Sulphate of potash magnesia, per ton, c.i.f. Atlantic and Gulf ports | Manure salts bulk, per unit, c.i.f. Atlantic and Gulf ports[1] | Kainit, 20% bulk, per unit, c.i.f. Atlantic and Gulf ports |
|---|---|---|---|---|---|---|---|---|
| 1910–14 | $0.536 | $3.61 | $4.88 | $0.714 | $0.953 | $24.18 | $0.657 | $0.655 |
| 1922 | .566 | 3.12 | 6.90 | .632 | .904 | 23.87 | .... | .508 |
| 1923 | .550 | 3.08 | 7.50 | .588 | .836 | 23.32 | .... | .474 |
| 1924 | .502 | 2.31 | 6.60 | .582 | .860 | 23.72 | .... | .472 |
| 1925 | .600 | 2.44 | 6.16 | .584 | .860 | 23.72 | .... | .483 |
| 1926 | .598 | 3.20 | 5.57 | .596 | .854 | 23.58 | .537 | .524 |
| 1927 | .525 | 3.09 | 5.50 | .646 | .924 | 25.55 | .586 | .581 |
| 1928 | .580 | 3.12 | 5.50 | .669 | .957 | 26.46 | .607 | .602 |
| 1929 | .609 | 3.18 | 5.50 | .672 | .962 | 26.59 | .610 | .605 |
| 1930 | .542 | 3.18 | 5.50 | .681 | .973 | 26.92 | .618 | .612 |
| 1931 | .485 | 3.18 | 5.50 | .681 | .973 | 26.92 | .618 | .612 |
| 1932 | .458 | 3.18 | 5.50 | .681 | .963 | 26.90 | .618 | .591 |
| 1933 | .434 | 3.11 | 5.50 | .662 | .864 | 25.10 | .601 | .565 |
| 1934 | .487 | 3.14 | 5.67 | .486 | .751 | 22.49 | .483 | .471 |
| 1935 | .492 | 3.30 | 5.69 | .415 | .684 | 21.44 | .444 | .488 |
| 1936 | .476 | 1.85 | 5.50 | .464 | .708 | 22.94 | .505 | .560 |
| 1937 | .510 | 1.85 | 5.50 | .508 | .757 | 24.70 | .556 | .607 |
| 1938 | .492 | 1.85 | 5.50 | .523 | .774 | 15.17 | .572 | .623 |
| 1939 | .478 | 1.90 | 5.50 | .521 | .751 | 24.52 | .570 | .670 |
| 1940 | .516 | 1.90 | 5.50 | .517 | .730 | 24.75 | .573 | .... |
| 1941 | .547 | 1.94 | 5.64 | .522 | .780 | 25.55 | .570 | .... |
| 1942 | .600 | 2.13 | 6.29 | .522 | .810 | 25.74 | .205 | .... |
| 1943 | .631 | 2.00 | 5.93 | .522 | .786 | 25.35 | .195 | .... |
| 1944 | .645 | 2.10 | 6.10 | .522 | .777 | 25.35 | .195 | .... |
| 1945 | | | | | | | | |
| March | .650 | 2.20 | 6.20 | .535 | .797 | 26.00 | .200 | .... |
| April | .650 | 2.20 | 6.20 | .535 | .797 | 26.00 | .200 | .... |
| May | .650 | 2.20 | 6.20 | .535 | .797 | 26.00 | .200 | .... |
| June | .650 | 2.20 | 6.20 | .471 | .701 | 22.88 | .176 | .... |
| July | .650 | 2.20 | 6.20 | .503 | .749 | 24.44 | .188 | .... |
| August | .650 | 2.20 | 6.20 | .503 | .749 | 24.44 | .188 | .... |
| September | .650 | 2.20 | 6.20 | .503 | .749 | 24.44 | .188 | .... |
| October | .650 | 2.20 | 6.28 | .535 | .797 | 26.00 | .200 | .... |
| November | .650 | 2.20 | 6.40 | .535 | .797 | 26.00 | .200 | .... |
| December | .650 | 2.20 | 6.40 | .535 | .797 | 26.00 | .200 | .... |
| 1946 | | | | | | | | |
| January | .650 | 2.20 | 6.40 | .535 | .797 | 26.00 | .200 | .... |
| February | .650 | 2.20 | 6.40 | .535 | .797 | 26.00 | .200 | .... |
| March | .650 | 2.20 | 6.40 | .535 | .797 | 26.00 | .200 | .... |
| **Index Numbers (1910-14 = 100)** | | | | | | | | |
| 1922 | 106 | 87 | 141 | 89 | 95 | 99 | .... | 78 |
| 1923 | 103 | 85 | 154 | 82 | 88 | 96 | .... | 72 |
| 1924 | 94 | 64 | 135 | 82 | 90 | 98 | .... | 72 |
| 1925 | 110 | 68 | 126 | 82 | 90 | 98 | .... | 74 |
| 1926 | 112 | 88 | 114 | 83 | 90 | 98 | 82 | 80 |
| 1927 | 100 | 86 | 113 | 90 | 97 | 106 | 89 | 89 |
| 1928 | 108 | 86 | 113 | 94 | 100 | 109 | 92 | 92 |
| 1929 | 114 | 88 | 113 | 94 | 101 | 110 | 93 | 92 |
| 1930 | 101 | 88 | 113 | 95 | 102 | 111 | 94 | 93 |
| 1931 | 90 | 88 | 113 | 95 | 102 | 111 | 94 | 93 |
| 1932 | 85 | 88 | 113 | 95 | 101 | 111 | 94 | 90 |
| 1933 | 81 | 86 | 113 | 93 | 91 | 104 | 91 | 86 |
| 1934 | 91 | 87 | 110 | 68 | 79 | 93 | 74 | 72 |
| 1935 | 92 | 91 | 117 | 58 | 72 | 89 | 68 | 75 |
| 1936 | 89 | 51 | 113 | 65 | 74 | 95 | 77 | 85 |
| 1937 | 95 | 51 | 113 | 71 | 79 | 102 | 85 | 93 |
| 1938 | 92 | 51 | 113 | 73 | 81 | 104 | 87 | 95 |
| 1939 | 89 | 53 | 113 | 73 | 79 | 101 | 87 | 93 |
| 1940 | 96 | 53 | 113 | 72 | 77 | 102 | 87 | .... |
| 1941 | 102 | 54 | 110 | 73 | 82 | 106 | 87 | .... |
| 1942 | 112 | 59 | 129 | 73 | 85 | 106 | 84 | .... |
| 1943 | 117 | 55 | 121 | 73 | 82 | 105 | 83 | .... |
| 1944 | 120 | 58 | 125 | 73 | 82 | 105 | 83 | .... |
| 1945 | | | | | | | | |
| March | 121 | 61 | 127 | 75 | 84 | 108 | 83 | .... |
| April | 121 | 61 | 127 | 75 | 84 | 108 | 83 | .... |
| May | 121 | 61 | 127 | 75 | 84 | 108 | 83 | .... |
| June | 121 | 61 | 127 | 66 | 74 | 95 | 80 | .... |
| July | 121 | 61 | 127 | 70 | 79 | 101 | 82 | .... |
| August | 121 | 61 | 127 | 70 | 79 | 101 | 82 | .... |
| September | 121 | 61 | 127 | 70 | 79 | 101 | 82 | .... |
| October | 121 | 61 | 129 | 75 | 84 | 108 | 83 | .... |
| November | 121 | 61 | 131 | 75 | 84 | 108 | 83 | .... |
| December | 121 | 61 | 131 | 75 | 84 | 108 | 83 | .... |
| 1946 | | | | | | | | |
| January | 121 | 61 | 131 | 75 | 84 | 108 | 83 | .... |
| February | 121 | 61 | 131 | 75 | 84 | 108 | 83 | .... |
| March | 121 | 61 | 131 | 75 | 84 | 108 | 83 | .... |

## Combined Index Numbers of Prices of Fertilizer Materials, Farm Products and All Commodities

| | Farm prices* | Prices paid by farmers for commodities bought* | Wholesale prices of all commodities† | Fertilizer materials‡ | Chemical ammoniates | Organic ammoniates | Superphosphate | Potash |
|---|---|---|---|---|---|---|---|---|
| 1922..... | 132 | 149 | 141 | 116 | 101 | 145 | 106 | 85 |
| 1923..... | 143 | 152 | 147 | 114 | 107 | 144 | 103 | 79 |
| 1924..... | 143 | 152 | 143 | 103 | 97 | 125 | 94 | 79 |
| 1925..... | 156 | 156 | 151 | 112 | 100 | 131 | 109 | 80 |
| 1926..... | 146 | 155 | 146 | 119 | 94 | 135 | 112 | 86 |
| 1927..... | 142 | 153 | 139 | 116 | 89 | 150 | 100 | 94 |
| 1928..... | 151 | 155 | 141 | 121 | 87 | 177 | 108 | 97 |
| 1929..... | 149 | 154 | 139 | 114 | 79 | 146 | 114 | 97 |
| 1930..... | 128 | 146 | 126 | 105 | 72 | 131 | 101 | 99 |
| 1931..... | 90 | 126 | 107 | 83 | 62 | 83 | 90 | 99 |
| 1932..... | 68 | 108 | 95 | 71 | 46 | 48 | 85 | 99 |
| 1933..... | 72 | 108 | 96 | 70 | 45 | 71 | 81 | 95 |
| 1934..... | 90 | 122 | 109 | 72 | 47 | 90 | 91 | 72 |
| 1935..... | 109 | 125 | 117 | 70 | 45 | 97 | 92 | 63 |
| 1936..... | 114 | 124 | 118 | 73 | 47 | 107 | 89 | 69 |
| 1937..... | 122 | 131 | 126 | 81 | 50 | 129 | 95 | 75 |
| 1938..... | 97 | 123 | 115 | 78 | 52 | 101 | 92 | 77 |
| 1939..... | 95 | 121 | 112 | 79 | 51 | 119 | 89 | 77 |
| 1940..... | 100 | 122 | 115 | 80 | 52 | 114 | 96 | 77 |
| 1941..... | 124 | 131 | 127 | 86 | 56 | 130 | 102 | 77 |
| 1942..... | 159 | 152 | 144 | 93 | 57 | 161 | 112 | 77 |
| 1943..... | 192 | 167 | 150 | 94 | 57 | 160 | 117 | 77 |
| 1944..... | 195 | 176 | 151 | 96 | 57 | 174 | 120 | 76 |
| 1945 | | | | | | | | |
| March..... | 198 | 180 | 153 | 97 | 57 | 175 | 121 | 78 |
| April..... | 203 | 180 | 154 | 97 | 57 | 175 | 121 | 78 |
| May..... | 200 | 180 | 154 | 97 | 57 | 175 | 121 | 78 |
| June..... | 206 | 180 | 155 | 95 | 57 | 175 | 121 | 69 |
| July..... | 206 | 180 | 154 | 96 | 57 | 175 | 121 | 74 |
| August.... | 204 | 180 | 154 | 96 | 57 | 175 | 121 | 74 |
| September. | 197 | 181 | 153 | 96 | 57 | 175 | 121 | 74 |
| October... | 199 | 182 | 154 | 97 | 57 | 175 | 121 | 78 |
| November. | 205 | 182 | 156 | 97 | 57 | 175 | 121 | 78 |
| December. | 207 | 183 | 156 | 97 | 57 | 175 | 121 | 78 |
| 1946 | | | | | | | | |
| January... | 206 | 184 | 156 | 97 | 57 | 175 | 121 | 78 |
| February.. | 207 | 185 | 156 | 97 | 57 | 175 | 121 | 78 |
| March.... | 209 | 186 | 158 | 97 | 57 | 175 | 121 | 78 |

* U. S. D. A. figures. Beginning January 1946 farm prices and index numbers of specific farm products revised from a calendar year to a crop-year basis. Truck crops index adjusted to the 1924 level of the all-commodity index.

† Department of Labor index converted to 1910-14 base.

‡ The Index numbers of prices of fertilizer materials are based on original study made by the Department of Agricultural Economics and Farm Management, Cornell University, Ithaca, New York. These indexes are complete since 1897. The series was revised and reweighted as of March 1940 and November 1942.

[1] **Beginning with June 1941, manure salts prices are F. O. B. mines, the only basis now quoted.**

** **The annual average of potash prices is higher than the weighted average of prices actually paid because since 1926 better than 90% of the potash used in agriculture has been contracted for during the discount period. From 1937 on, the maximum seasonal discount has been 12%.**

# REVIEWS

**This section contains a short review of some of the most practical and important bulletins, and lists all recent publications of the United States Department of Agriculture, the State Experiment Stations, and Canada, relating to Fertilizers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.**

## Fertilizer

*"Agricultural Mineral Sales as Reported to Date for Quarter Ended December 31, 1945," Dept. of Agr., Bur. of Chem., Sacramento 14, Calif., FM-122, March 6, 1945.*

*"Commercial Fertilizer Sales as Reported to Date for the Quarter Ended December 31, 1945," Dept. of Agr., Bur. of Chem., Sacramento 14, Calif., FM-123, March 6, 1945.*

*"Panel on Fertilizers and Soil Amendments," Agri. Exp. Sta., Colo. A. & M. College, Fort Collins, Colo., Misc. Ser. No. 290, Dec. 1945, R. H. Tucker.*

*"Homemade Lime and Fertilizer Spreaders," Coop. Ext. Work, State of Dela., Newark, Dela., Mimeo Cir. 39, Feb. 1945, C. E. Phillips.*

*"Fertilizer Recommendations for Field Crops in Iowa," Ext. Section, Agron. Dept., Iowa State College, Ames, Iowa, Pamphlet 112, H. B. Cheney and H. R. Meldrum.*

*"Minor Plant Food Elements," Ext. Serv., Clemson, S. C., C. G. Peebles.*

*"Field Trials with Fertilizers in South Dakota 1945," Agr. Exp. Sta., S. Dak. State College, Brookings, S. Dak., Pamphlet No. 6, Dec. 1945, W. W. Worzella and Leo F. Puhr.*

*"Correcting Potash Deficiency in Growing Corn," Agr. Exp. Sta., Univ. of Tenn., Knoxville, Tenn., Cir. 93, Dec. 1945, John B. Washko.*

*"Pasture Fertilization Experiments at Reymann Memorial Farm," Agr. Exp. Sta., W. Va. Univ., Morgantown, W. Va., Bul. 324, Nov. 1945, F. W. Schaller, G. G. Pohlman, H. O. Henderson, and R. A. Ackerman.*

## Soils

*"Soil Testing: A Review of Principles and Procedures," Agron. Dept., Iowa State College, Ames, Iowa, Agron. 36.*

*"Effect of Weathering on Houston Black Clay," Agr. Exp. Sta., Miss. State College, State College, Miss., Inf. Sheet 356, Oct. 1945, Russell Woodburn.*

*"Major Soil Areas of Missouri," Agr. Exp. Sta., Univ. of Mo., Columbia, Mo., Cir. 304, Aug. 1945, H. H. Krusekopf.*

## Crops

*"Annual Reports—54th and 55th—January 1, 1943—December 31, 1944," Agr. Exp. Sta., Ala. Polytechnic Inst., Auburn, Ala.*

*"Corn Hybrids Recommended for Production in Ontario—1946," Dom. of Canada, Dept. of Agr., Ottawa, Suppl. to Pamphlet 22, Feb. 1946.*

*"Grain Corn Trials Mt. Carmel and Windsor, Connecticut 1945," Agr. Exp. Sta., New Haven, Conn., R. P. 45G1, D. F. Jones and O. E. Nelson, Jr.*

*"Growing Fruits for Home Use," Coop. Ext. Work, Univ. of Dela., Newark, Dela., Bul. 45, June 1945, A. L. Kenworthy, P. L. Rice, and S. L. Hopperstead.*

*"1944 Annual Report to Delaware Farmers," Agr. Ext. Serv., Univ. of Dela., Newark, Dela., Bul. 46, June 1945.*

*"Chufas in Florida," Agr. Exp. Sta., Gainesville, Fla., Bul. 419, Jan. 1946, G. B. Killinger and W. E. Stokes.*

*"Modernizing Cotton Production in Georgia," Agr. Ext. Serv., Univ. System of Ga., Athens, Ga., Bul. 523, June 1945, E. C. Westbrook.*

*"Varieties of Fruits for Indiana," Dept. of Agr. Ext., Purdue Univ., Lafayette, Ind., Leaf. 27, 1945.*

*"Effect of Certain Summer and Winter Legume Crops in Improving Corn Yields in South Louisiana," Agr. Exp. Sta., La. State Univ., Baton Rouge, La., Bul. 396, Sept. 1945, H. B. Brown.*

*"Louisiana Creole Onion Best for Bulbs and Seed," Agr. Ext., La. State Univ., Baton Rouge, La., Cir. 242, 3rd Ed. Oct. 1945, Joseph Montelaro.*

*"A Preliminary Report of Certain Tests Conducted by the Crops and Soils Department of the Louisiana Experiment Station 1945," Agr. Exp. Sta., La. State Univ., Baton Rouge, La., W. G. Taggart.*

*"Landscaping the Farmstead," Agr. Ext. Serv., Univ. of Minn., St. Paul, Minn., Bul. 250, March 1946, Leon C. Snyder.*

*"Suwannee, A New Home-Garden Strawberry," Agr. Exp. Sta., Miss. State College, State College, Miss., Cir. 123, Sept. 1945, N. H. Loomis and George M. Darrow.*

*"Winter Legumes with Tung Trees," Agr. Exp. Sta., Miss. State College, State College, Miss., Inf. Sheet 354, Sept. 1945, S. R. Greer.*

*"Cabbage Variety Tests: Poplarville, 1944-1945," Agr. Exp. Sta., Miss. State College, State College, Miss., Inf. Sheet 355, Sept. 1945, T. E. Ashley.*

*"Small Grains Test, Stoneville, 1945," Agr. Exp. Sta., Miss. State College, State College, Miss., Serv. Sheet 398, Sept. 1945, P. W. Gull.*

*"Alfalfa in Missouri," Agr. Exp. Sta., Univ. of Mo., Columbia, Mo., Bul. 492, Aug. 1945, W. C. Etheridge and C. A. Helm.*

*"Better Pastures for North Carolina," Agron. Dept., Univ. of N. C., Raleigh, N. C., Cir. 286, Nov. 1945, E. R. Collins, W. W. Woodhouse, R. L. Lovvorn, and H. Brooks James.*

*"Performance Tests of Corn Varieties and Hybrids, 1945," Agr. Exp. Sta., Okla. A. & M. College, Stillwater, Okla., Bul. B-292, Feb. 1946, James S. Brooks.*

*"Growing Tomatoes in the Home Garden," Agr. Ext. Serv., S. Dak. State College, Brookings, S. Dak., War Food Ser. No. 5, March 1945, Edward O. Olson.*

*"Tennessee Luscious Red Raspberry," Agr. Exp. Sta., Univ. of Tenn., Knoxville, Tenn., Cir. 92, Oct. 1945, Brooks D. Drain.*

*"Tomato Variety Test in the Wichita Valley," Agr. Exp. Sta., A. & M. College, College Station, Texas, P.R. 975, L. E. Brooks and V. I. Woodfin.*

*"The 1945 Official Virginia Varietal Tests of Corn Hybrids, Barley, Oats, and Wheat," Agr. Exp. Sta., Va. Polytechnic Inst., Blacksburg, Va., Bul. 383, Dec. 1945, M. H. McVickar and T. M. Starling.*

*"The Growth and Composition of the Tops of Peach Trees in Sand Culture in Relation to Nutrient-element Balance," Agr. Exp. Sta., W. Va. Univ., Morgantown, W. Va., Bul. 322, Sept. 1945, D. S. Brown.*

*"Results of Hybrid Corn Yield Trials in West Virginia for 1945," Agr. Exp. Sta., W. Va. Univ., Morgantown, W. Va., Mimeo Cir. 56, Feb. 15, 1946, J. L. Cartledge, R. J. Friant, C. C. Lima, R. M. Smith, and D. R. Browning.*

*"Twenty Fifth Annual Report Wood County Extension Service," County Agr. Agent, Wisconsin Rapids, Wis., 1945, H. R. Lathrope, Cecelia M. Shestock, E. E. Anderson, and Elmer Miller.*

*"Mechanical Treatments for Increasing the Grazing Capacity of Shortgrass Range," Agr. Ext. Sta., Univ. of Wyo., Laramie, Wyo., Bul. 273, June 1945, O. K. Barnes and A. L. Nelson.*

*"Report of the Administrator of Agricultural Research 1945," U.S.D.A., Washington, D. C.*

*"Report of the Chief of the Office of Experiment Stations, Agricultural Research Administration, 1945," U.S.D.A., Washington, D. C., Sept. 15, 1945.*

*"Report of the Chief of the Bureau of Agricultural and Industrial Chemistry, Agricultural Research Administration, 1945," U.S.D.A., Washington, D. C., Sept. 28, 1945.*

## Economics

*"A Farm Management Analysis of Dairy Farming in Putnam County, Georgia, 1944," Ga. Exp. Sta., Experiment, Ga., Bul. 244, Oct. 1945, J. C. Elrod and W. E. Hendrix.*

*"An Economic Study of the Sweet Potato Enterprise in the North Louisiana Upland Cotton Area in 1943," Dept. of Agr. Econ., La. State Univ., Baton Rouge, La., Bul. 395, Aug. 1945, Leo J. Fenske and J. Norman Efferson.*

*"An Economic Study of Peach Production in Louisiana," Agr. Exp. Sta., La. State Univ., Baton Rouge, La., Bul. 398, Nov. 1945, Frank D. Barlow, Jr.*

*"Development of the Dairy Industry in Mississippi," Agr. Exp. Sta., Miss. State College, State College, Miss., Bul. 422, July 1945, D. W. Parvin.*

*"Balanced Farming Workbook," Coop. Ext. Work, Univ. of Mo., Columbia, Mo.*

*"Oklahoma Farm Real Estate Activity 1941-1944," Agr. Exp. Sta., Okla. A. & M. College, Stillwater, Okla., Bul. B-291, Feb. 1946, Randall T. Klemme and Erwin C. Ford.*

*"A Statement on Farming in Rhode Island," Coop. Ext. Work, R. I. State College, Kingston, R. I., Mimeo. Cir. 39, Jan. 1945, J. L. Tennant and G. E. Bond.*

*"The Agricultural Outlook, South Carolina 1946," Ext. Serv., Clemson Agr. College, Clemson, S. C., Cir. 277, Feb. 1946.*

*"Information Basic to Adjustments in Rice Production in Texas," Agr. Exp. Sta., College Sta., Texas, Bul. 676, Nov. 1945, A. C. Magee and C. A. Bonnen.*

*"Trend in the Sales Price of Farm and Ranch Lands in Texas 1920-1944," Agr. Exp. Sta., A. & M. College, College Station, Texas, P.R. 971, Nov. 1945, L. P. Gabbard, Erwin C. Ford, and J. Lambert Molyneaux.*

*"Strawberry Cost Study," Agr. Ext. Serv., State College of Wash., Pullman, Wash., Mimeo Cir. 330, June 1945.*

*"Report of the Chief of the Bureau of Agricultural Economics, Fiscal Year 1945," U.S.D.A., Washington, D. C., Sept. 1, 1945.*

*"Looking Ahead with Cotton," U.S.D.A., Washington, D. C., Misc. Publ. 584, Dec. 1945.*

*"What Peace Can Mean to American Farmers, Agricultural Policy," U.S.D.A., Washington, D. C., Misc. Publ. 589, Dec. 1945.*

*"Handbook on Major Regional Farm Supply Purchasing Cooperatives 1943 and 1944," Farm Credit Adm., U.S.D.A., Washington, D. C., Misc. Rept. 89, Oct. 1945, Joseph G. Knapp and Jane L. Scearce.*

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Her: "Don't you think a man has more sense after he's married?"

Him: "Yes, but it's too late then."

"So you bought a home in the country?"

"Yes. Five rooms and a path."

# Sugar From Research

Scant sugar supplies would have been even scantier during the war years—and this year, too—but for two distinct but related research activities by the U. S. Department of Agriculture in the years between the wars.

When war disturbs sugar imports, the domestic supply of beet sugar is increasingly important. In World War I, sugar beet production was complicated by difficulties in getting beet seed from Europe, where most of the American supply had been grown because of lower labor costs. In World War II, the beet farmer had better varieties to grow. For planting in the West he had the U. S. varieties resistant to the devastating disease, curly top, that is transmitted by the beet leafhopper. This was a result of research that is continuing with view to further improvement of disease resistance.

The other research made possible an ample seed supply of these adapted varieties grown here in the United States. The sugar beet normally requires growth in two seasons to produce a seed crop. The old practice was to grow beets for a season, dig them, store them over winter, replant them in spring, and harvest seed the second summer. This system called for so much hand labor that European growers with lower labor costs, essentially monopolized beet seed production.

In cooperative work at the New Mexico Agricultural Experiment Station, State and Federal scientists observed in 1922 that fall-planted sugar beets remained alive over winter in the mild climate and produced seed the second year without need for storage and replanting. By 1928 the system of seed growing by wintering beets in the field had been developed, and Federal experimenters have since adapted the method to other areas. Most of the operations have been mechanized so that beet seed production costs in the United States compare favorably with those of hand-grown crops abroad.

The Department of Agriculture has figured up the costs of developing this new method of growing sugar beet seed. It cost about $400,000, for part-time work of two men in the initial period from 1922 to 1928, and part-time work of about 10 men since then in extending its scope. The value of the discovery is estimated at fully $1,500,000 a year —every year. This is a continuing gain, and is based, not on the value of the sugar crop that is a result, but only on the value of the beet seed produced as a result of the work.

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## Alfalfa in Miss. Decreased As Soil Fertility Declined

(*From page* 16)

tility is a controlling factor in the successful production of alfalfa, and that the strange malady that killed alfalfa was low soil fertility. Ten tons of manure per acre increased the yields over the five-year period from 1.63 to 2.35 tons per acre. This was more than either superphosphate or basic slag produced alone. Twenty tons of stable manure was still superior to the 10-ton application. Twenty tons of manure and 500 pounds of basic slag produced the highest yield, which was 3.18 tons of alfalfa hay per acre. The manure,

being a good source of potash and nitrogen, supplied most all of the nutrients needed except phosphate. The soil used for this experiment was Houston Clay, one of the principal dark soils, and was naturally well supplied with lime.

Data from another test started in the spring of 1926 are given in Table 4. These data again show that when fertility is added to the soil, alfalfa can be produced. Twenty tons of manure produced yields about equal to the yields produced by 10 tons of manure and 500 pounds of superphosphate. Basic slag is sometimes referred to as a "foolproof" fertilizer for legumes, but in this test it was not sufficient in fertility value to produce alfalfa yields equal to that produced on plots receiving stable manure.

At the time of these experiments, manure and phosphate seemed to supply the needed fertility elements. In recent years it has been found that potash and boron also are necessary for the most efficient production of alfalfa on some soils. Figure 2 shows alfalfa growing on a soil low in fertility after it has been treated with manure, lime, superphosphate, potash, and borax. Many of the fairly deep, well-drained soils will produce alfalfa, provided the fertility required by this crop is added.

The acreage planted to alfalfa in the prairie counties at present has increased some since 1924, by virtue of added fertility, but it is still far short of the acreage planted in 1919. The production of the crop in this area is largely confined to the fertile alluvial and colluvial soils; and even on these soils, potash, phosphorus, and boron are usually necessary for high yield and longevity of stands. By taking care of the fertility problems, good alfalfa yields have recently been produced on some fields for six successive years without difficulty. This is probably as long as one field should remain continuously in this crop.

The failure of alfalfa to grow on land where it has once grown successfully was a signal that the fertility of the soils was below the level required by this legume. This should have been a warning to the farmers that the soils were sick and needed doctoring as well as protection from erosion. Instead

**Fig. 2.—Alfalfa grew on a poor soil after manure, lime, potash, phosphate, and borax had been applied.**

**Fig. 3.—Gently rolling topography, pastures, and dairy cows are characteristic of the Black Belt.**

they sought new plants that would grow on soils low in fertility and, consequently, contain little mineral elements in the forage.

The plant, after all, is an expression of the fertility level of the soil and a serious mistake can be made by directing full attention to selection of plants that will grow on poor land and neglecting the soil problems. The plant has the ability to manufacture carbohydrates by using the raw materials of air and water in the presence of sunshine, but the only source a plant has for important minerals is the soil. Naturally, if the soil is low or deficient in minerals the plant, if it grows, must be low in the same.

In farm management some thought should be given to the fertility that is delivered by the soil to crops as well as bulk or tonnage per acre. Continued plant selection as crops fail to grow may eventually reduce the soil fertility to a level where only poverty vegetation will survive. An effort many years ago to maintain the fertility level of the soil near the alfalfa standard would have paid great dividends on many farms throughout the Black Belt section. Much attention has been given lately throughout the country to saving the body of the soil. It is high time for some attention to be given to saving the "soul" of the soil (fertility) as well as the body.

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## Plow-Under Fertilizer Ups Corn Yields

(*From page* 22)

the 8-8-8 where both were plowed under at the 50 pounds/acre nitrogen level.

3. Nitrogen fertilizer plowed under is more efficient in terms of unit cost than 8-8-8 plowed under when residual effect is not considered.

4. Significant increases in yield have been obtained from the treatments on

## TABLE 3.—PLOWING UNDER FERTILIZER FOR CORN DEMONSTRATIONS

1945

Plants per Acre and Yield in Bushels of Shelled Corn per Acre at 15½% Moisture

| Soil Type | Light Planting Rate | | | | | | Heavy Planting Rate | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Fertilizer Treatment | | | | | | | | | | | |
| | Row | | Row +8-8-8 | | Row +Nitrogen | | Row | | Row +8-8-8 | | Row +Nitrogen | |
| Rimer | 8629 | 79.0 | 9920 | 83.0 | 8897 | 87.3 | 11826 | 86.3 | 11826 | 97.2 | 12694 | 95.9 |
| Fincastle-Brookston | 8379 | 96.1 | 8885 | 101.6 | 8319 | 92.7 | 11121 | 97.5 | 11416 | 111.0 | 10708 | 108.0 |
| Fincastle | 11368 | 65.1 | 10074 | 72.5 | 11564 | 83.5 | 14863 | 68.8 | 15288 | 97.0 | 15190 | 97.2 |
| Clyde | 8557 | 65.2 | 8210 | 78.5 | 8230 | 76.9 | 8936 | 70.4 | 11270 | 84.3 | 10780 | 92.1 |
| Crosby-Brookston | 10705 | 73.5 | 9114 | 87.7 | 9548 | 84.8 | 11934 | 82.8 | 12477 | 84.9 | 12477 | 113.9 |
| Belmore | 10910 | 75.7 | 11146 | 99.8 | 10976 | 85.4 | 13850 | 78.8 | 13622 | 92.5 | 14210 | 95.9 |
| Clyde | 13850 | 65.7 | 13720 | 74.9 | 14308 | 99.1 | 16660 | 72.1 | 18620 | 75.8 | 16856 | 88.0 |
| Fincastle-Blanchester | 7788 | 66.9 | 7080 | 68.4 | 7257 | 82.0 | 12390 | 84.0 | 12036 | 91.4 | 11328 | 92.6 |
| Brookston | 8938 | 71.4 | 8584 | 71.9 | 7876 | 70.4 | 9027 | 71.5 | 11151 | 76.7 | 10885 | 76.1 |
| Miami | 10388 | 69.7 | 10878 | 65.2 | 10976 | 69.8 | 14151 | 66.4 | 14210 | 86.0 | 14504 | 77.8 |
| Fulton | 8428 | 43.6 | 11270 | 60.8 | 8722 | 63.4 | 9996 | 58.2 | 9800 | 62.7 | 10878 | 75.8 |
| Brookston | 10692 | 64.1 | 12054 | 70.2 | 11074 | 73.2 | 15043 | 61.4 | 16266 | 75.4 | 16562 | 87.6 |
| Berrien | 10662 | 103.4 | 11662 | 119.1 | 10878 | 110.1 | 13751 | 106.8 | 14112 | 123.9 | 13720 | 108.3 |
| Paulding | 10845 | 78.9 | 11564 | 89.6 | 10094 | 84.6 | 13037 | 74.6 | 14210 | 103.5 | 14602 | 89.3 |
| Fincastle | 10244 | 97.0 | 11495 | 115.4 | 10285 | 105.1 | 14155 | 114.7 | 14032 | 119.9 | 14641 | 127.7 |
| Miami-Brookston | 11212 | 76.4 | 11858 | 105.3 | 12342 | 93.5 | 14600 | 78.0 | 14032 | 114.3 | 13648 | 111.1 |
| Miami-Brookston | 9146 | 91.2 | 8428 | 84.3 | 9212 | 88.2 | 10877 | 79.6 | 11368 | 100.6 | 11760 | 88.3 |
| Brookston | 12020 | 67.2 | 12054 | 83.0 | 12052 | 79.4 | 14543 | 66.0 | 14798 | 76.1 | 14896 | 68.3 |
| Nappanee | 9506 | 68.4 | 9506 | 82.2 | 9310 | 63.7 | 10682 | 68.4 | 11956 | 89.5 | 12544 | 82.8 |
| Miami-Brookston | 8199 | 68.4 | 8624 | 73.9 | 7840 | 65.9 | 9571 | 70.7 | 9310 | 80.8 | 10780 | 80.8 |
| Average | 10023 | 74.3 | 10306 | 84.3 | 9988 | 82.9 | 12550 | 77.8 | 13090 | 92.1 | 13182 | 92.8 |
| Average increase over check | | | | 10.0 | | 8.6 | | | | 14.3 | | 15.0 |

## TABLE 3A.—THE EFFECT OF TREATMENT ON YIELD

1945

| Planting Rate | Treatment, Yield, and Increases in Bushels per Acre | | | | |
|---|---|---|---|---|---|
| | Row Only | Row +8-8-8 | | Row +Nitrogen | |
| Plants per Acre | Yield | Yield | Increase | Yield | Increase |
| 8,000 to 10,000 | 70.8 | 79.5 | 8.7 | 77.5 | 6.7 |
| 10,001 to 12,000 | 79.8 | 91.9 | 12.1 | 87.5 | 7.7 |
| 12,001 and over | 77.2 | 91.2 | 14.0 | 94.6 | 17.4 |

## TABLE 3B.—THE EFFECT OF RATE OF PLANTING ON YIELD

1945

| Treatment | Rate of Planting, Yield, and Increases in Bushels per Acre | | | | |
|---|---|---|---|---|---|
| | Plants per Acre | Plants per Acre | | Plants per Acre | |
| | 8,000 to 10,000 | 10,001 to 12,000 | | 12,001 and over | |
| | Yield | Yield | Increase | Yield | Increase |
| Row only | 70.8 | 79.8 | 9.0 | 77.2 | 6.4 |
| Row +8-8-8 | 79.5 | 91.9 | 12.4 | 91.2 | 11.7 |
| Row +Nitrogen | 77.5 | 87.5 | 10.0 | 94.6 | 17.1 |

## TABLE 3C.—FERTILIZER, RATE OF APPLICATION AND COST PER ACRE

1945

| Fertiliser | Grade | Av. Lbs/Acre | Av. Cost/Acre* |
|---|---|---|---|
| Row only | Single strength | 229 | $3.66 |
| Plow under | 8-8-8 | 600 | $12.04 |
| Plow under | Am. Sul. | 250 | $5.34 |

* 1945 Spring Cash Price.

soils of high fertility level as well as on poorer soils.

5: To obtain maximum returns for large applications of fertilizer, it is necessary to maintain a planting rate of 12,000 to 14,000 plants per acre.

6. The lack or excess of soil moisture at critical growth periods may completely overshadow responses from added plant-food nutrients.

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## Soil Conservation Districts and District Supervisors

(*From page* 18)

is doing and of his career as a farmer. He realizes fully that farming is a science that equals the science of medicine or even that of modern warfare not only in application, but in results.

If helping a man to a better way of life is accomplishment; if working for the perfecting of a better agriculture is a worthy endeavor; if coordinating our efforts with those of agricultural workers and individuals is service, then I may safely say that soil conservation district supervisors of South Carolina have made some contribution to mankind of this and future generations.

Like Richard Rumbold, I never could believe that Providence had sent a few men into the world ready booted and spurred to ride, and millions of others ready saddled and bridled to be ridden. All down the ages, we have heard the cries of the persecuted and underprivileged peoples. We have them ever before us in our own State and Southeastern Section. We have learned that there is no prosperity for the masses in slavery. We have experienced depression and prosperity; we have breathed the breath of freedom and found it good.

There is opportunity in the South, beginning with our wonderful climate and natural resources. The South has capital and management experience. It has talent and great potential wealth that awaits the unleashing of this talent. The South has for the past seven years had what we like to think is another asset—Soil Conservation Districts—through which each farmer has an opportunity to enter into the making and effecting of agricultural policies. By means of these districts, we supervisors see a perpetuation of that freedom we prize so dearly—that freedom which we are not willing to exchange for anything—certainly not for temporary security, nor even the salvation of our soil for we do not believe that freedom nor soil conservation can be attained by increasing governmental control, but only by understanding, aggressive activity, ingenuity, and cooperation of each individual farmer; for the prosperity of one farmer is more or less dependent upon that of his neighbor and the prosperity of communities and towns depend upon the type of agriculture that surrounds them.

Development does not come by coddling an individual or a nation. Nor does cutting the pattern of an individual's life develop initiative which leads to accomplishment and progress and individual freedom and strength of character.

Yes, we want soil conservation and the permanent agriculture that will result. Yes, we want the better way of life for our children's children. That is the goal of soil conservation district supervisors and the agricultural workers and friends who cooperate with us in assisting farmers to save soil resources through soil conservation districts. But, we want it through understanding of the need of saving soil, done voluntarily because of our acceptance of a trust placed in us by the Lord to pass the land on in better condition than we received it, with the joy that will result from a job well done and not by compulsion at the commands of a dictator which will take away our freedom in planting when and where; in selling

and buying when, where, and at what prices.

Supervisors of soil conservation districts offer districts to the South to be added to her other opportunities, believing that the development of the South will be hastened along agricultural and industrial lines; thereby enabling our South to make a greater contribution to the development of America and the world. Soil conservation district supervisors will take new hope from the progress made in the last five years. There is no limit to what we may achieve in saving soil and the benefits resulting, for in America there is no limit to achievement. We are free men. Let us cherish that freedom and foster it in the service we offer as soil conservation district supervisors until the philosophy of democracy is understood down to the grass roots, and each farmer avails himself of the privilege of making democracy work by understanding the need for his own participation in agricultural affairs of the district, the State, the South, and the Nation.

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## Potash Treatment Makes Better Sweet Clover

(*From page* 24)

TABLE 2. YIELD AND COMPOSITION OF SWEET CLOVER AT TWO GROWTH STAGES WITH DIFFERENT SOIL TREATMENT

| Part of Plant | DM lbs/A | Percentages | | |
|---|---|---|---|---|
| | | N | P | K |
| **Lime** | | | | |
| May 15 | | | | |
| Tops | 1,490 | 2.94 | .14 | .90 |
| Roots | 630 | 1.51 | .10 | .25 |
| June 25 | | | | |
| Tops | 5,640 | 1.34 | .09 | .52 |
| Roots | 1,460 | 1.01 | .06 | .32 |
| **Lime-Potash** | | | | |
| May 15 | | | | |
| Tops | 2,730 | 2.65 | .13 | 1.52 |
| Roots | 900 | 1.44 | .08 | .65 |
| June 25 | | | | |
| Tops | 5,280 | 1.49 | .10 | 1.11 |
| Roots | 1,920 | 1.03 | .05 | .36 |
| **Lime-Phosphate** | | | | |
| May 15 | | | | |
| Tops | 3,020 | 3.10 | .41 | .65 |
| Roots | 1,370 | 1.95 | .34 | .12 |
| June 25 | | | | |
| Tops | 5,630 | 1.97 | .26 | .44 |
| Roots | 1,490 | 1.28 | .28 | .09 |
| **Lime-Potash-Phosphate** | | | | |
| May 15 | | | | |
| Tops | 4,200 | 2.84 | .40 | 1.73 |
| Roots | 1,580 | 1.80 | .32 | .47 |
| June 25 | | | | |
| Tops | 10,150 | .94 | .19 | .92 |
| Roots | 2,280 | 1.41 | .19 | .40 |

dark-colored soils was nearly twice that which was grown on the low-nitrogen, light-colored soils. In all tests the sweet clover was thoroughly inoculated and had been grown on the land over a period of years, usually as a plow-under crop in a four-year rotation. Sweet clover grown on the dark soils was also slightly higher in phosphorus and considerably higher in potassium than that from the less productive light-colored soils. Calcium content was the reverse of that of potassium, because of the relationship existing between these two elements in plants of this type.

The need of sweet clover for a balanced fertility condition in soils is further illustrated by yield and composition results in Table 2. These data are for sweet clover grown on a light-colored southern Illinois soil. In an untreated condition this land was very acid, decidedly deficient in total nitrogen, and very low in available phosphorus and potassium.

In this field test (Table 2) lime applications alone gave a good stand and a reasonable growth of sweet clover as indicated by the dry weight of tops and roots which amounted to 7,100 pounds an acre June 25 at full bloom stage. Both potassium and phosphorus

**Fig. 2.—Sweet clover growing under the same conditions as shown in Fig. 1 except potash was omitted from the treatment.**

were deficient in the top growth on the lime-only treatment at both stages of growth May 15 and June 25. The potassium deficiency in the top growth was overcome where potash was added to the soil in addition to lime. Phosphorus deficiency was likewise overcome where phosphate was added in addition to lime, but the maximum growth and balanced composition were not obtained until the fertility elements in the soil were balanced by a combination of lime, potash, and phosphate. This combined treatment supplied sufficient potassium and phosphorus to give a relatively high content of these elements at the plow-under time of May 15 and at the full bloom stage of June 25.

When the phosphorus content of hay or forage is as low as .09 to .14 per cent as indicated in Table 2 on unphosphated land, it is too low for desirable feeding quality. Livestock fed too much and too long on this type of feed will in a relatively short time suffer serious consequences. This condition has been brought out by various results of extensive research in animal nutrition.

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## Rich Fog in the Hollows

(*From page* 26)

**Rich Air for Plants in the Hollows**

Carbon dioxide is a heavy gas. It is so heavy that when a silo is opened there is danger of suffocation for the person who enters the silo before doors have been opened to drain out the gas. Carbon dioxide will flow like water even though you cannot see it; high school students will recall how they can pour the gas from one beaker to another. We can draw the conclusions that it will flow from the higher

ground to the depression areas. If the carbon dioxide gas were to have a red color one would probably see a thick red fog in the depression areas on a warm summer day when a lot of decomposition or rotting of organic matter is taking place in the ground. One would probably see the hilltops and knolls standing out clearly because the air drainage would flow the carbon dioxide away. Perhaps it is a shortage of carbon dioxide on the hilltops that causes crops to be smaller on such places even though exceedingly heavily fertilized. We know that nutrients are carried in erosion materials and water run-off to depression places to enrich the soil in the hollows, but perhaps the extra richness in the hollows comes in part from the enriched carbon dioxide that undoubtedly occurs in such places, carbon dioxide that has flown into the depression as well as that which was formed there by virtue of a richer organic content in the soil.

If the carbon dioxide gas were red, it would be a spectacular sight on a warm summer day following a shower of rain to see it virtually billowing out of the soil in proportion to the organic matter decomposing in the soil. In the soil areas that contained a high quantity of organic matter, the evolution of carbon dioxide would be great and there the red gas would become thick. In the poorer spots of the field where the organic matter was more deficient, the evolution of this gas would be less; and on eroded areas where the subsoil was exposed where there is no organic matter, there would be no gas evolved. The summary of this whole story is that organic matter has virtues far beyond the simple ABC's of good farming practices. Organic matter probably enriches the atmosphere above the ground in addition to improving the moisture supply, porosity, available nitrogen, and other nutrient elements so that undoubtedly plants can grow faster and bigger because of the organic matter in the soil.

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## Potash Pays Good Dividends in Louisiana

(*From page* 25)

Most farms made only a bottom crop and under these adverse growing conditions, naturally the fertilizer used on cotton demonstrations was severely handicapped in its efficiency. In spite of this, the following summary on 83 cotton fertilizer demonstrations tells a convincing story. All demonstrations received 600 pounds of an 8-8-8 mixture per acre prior to planting. The average yield of seed cotton for all demonstrations was 1,248 pounds. Check plots averaged 829 pounds. The average net increase was 419 pounds or 50.5 per cent. (Note: All check plots were fertilized at the rate and grade commonly used on the cooperator's farm.)

*Upland Coastal Plain (Hill) Soils*

Fifty-four of these demonstrations were located on hill soils and the average yield for the demonstrations was 1,098 pounds seed cotton per acre. The checks averaged 696 pounds. The average net increase for the recommended fertilizer was 402 pounds or 57.7 per cent.

*Terrace (Bluff) Soils*

Seventeen demonstrations averaged 1,583 pounds. Checks averaged 1,154 pounds. The average net increase per acre for the demonstrations was 429 pounds or 37.1 per cent.

*Alluvial (River Bottom) Soils*

Twelve demonstrations averaged 1,447 pounds. Check plots averaged 964

pounds. The average increase was 583 pounds per acre or 60.4 per cent. (Note: These alluvial land demonstrations were located on the lighter, or sandy loam type soils.)

Thus it can be seen that cotton yields may be increased up to 60 per cent, even in an unfavorable season, by using the right grade and quantity of fertilizer. Also, when ample plant food is provided, there is no great difference in yields on hill, terrace, and alluvial soils.

### Sugarcane for Sugar

Louisiana grows about 350,000 acres of sugarcane for sugar. For many years, as well as at the present, the crop has been largely fertilized with straight nitrogen materials. Within the past three or four years it has been found that much of this sugarcane acreage responds profitably to liberal applications of phosphoric acid and potash. To illustrate this, one result demonstration gave the following:

| Treatment | Amount fertilizer per acre (lbs.) | Sucrose (per cent) | Increased sugar per acre (lbs.) | Increased value per acre (dollars) |
|---|---|---|---|---|
| 0–0–0 | check | 12.93 | ..... | ..... |
| 12–0–0 | 225 nitrate | 12.35 | 194 | 10.10 |
| 12–8–0 | 300 | 12.03 | 839 | 41.11 |
| 12–0–12 | 300 | 14.23 | 1,324 | 56.15 |
| 9–6–9 | 400 | 12.26 | 972 | 44.07 |

Out of 10 potash demonstrations reported, nine of them showed increases in sucrose content ranging from .3 up to 1.88 per cent. To give an idea of the significance of this extra sucrose, an increase of .5 per cent sucrose in 100 tons of cane increases the value of the cane in an amount equal to the full value of 10 tons. Potash did not increase the tonnage per acre to an appreciable extent, but the increase in sucrose content due to potash is highly significant.

### Pastures

Liberal applications of potash, particularly on lighter soils low in organic matter, have greatly increased the growth of clovers and lespedeza. In practically all cases it was observed that cattle with free choice did most of their grazing on the potash-treated areas. Also, the plants receiving a liberal supply of potash were a darker green color and withstood mild, dry weather to a greater extent than where little or no potash was used. On one good demonstration on terrace (bluff) type soil, the potash-treated part of the pasture was grazed clean by late June, while the growth on the remainder of the pasture, which received no potash, was from four to six inches high. The many good effects from potash on the ligher soils, low in organic matter, have resulted in the present pasture recommendation of 400 pounds of a 3-12-12 or 0-12-12 mixture per acre. On darker colored soils with more organic matter, the recommendation is to use 400 pounds of a 4-12-8 or 0-14-7 mixture per acre.

Potash-treated lespedeza demonstrations gave an average increase of about 30 per cent or one-half ton of cured hay per acre. One seed-harvest demonstration on Lintonia silt loam soil boosted the seed yield from 8 to 14 bushels per acre, or 75 per cent in favor of the potash treatment.

### Sweet Potatoes

One sweet potato potash demonstration on Lintonia silt loam soil gave a 50-bushel-per-acre increase where 100 pounds of potash were used in addition to 200 pounds of 4-12-4 per acre. The check plot received 200 pounds of 4-12-4.

Many areas of the State where 10 years ago it was said no potash application was needed now show a very profitable response to liberal potash applications. The reasons are obvious. These soils are getting older, the topsoil thinner and more devoid of organic matter, impervious hardpans have developed at plow-sole depth, and the natural reserves of potash have been used up, washed away, and leached out. A recent estimate on the plant-food needs of the State indicates that we could profitably use at least 45,000 more tons of potash than are now being used. The general feeling is that the use of more potash for Louisiana crops will develop both rapidly and extensively.

## Muck Soils Produce Quality Sweet Corn for Canning

(*From page* 13)

Over a period of years, Golden Cross Bantam has proven to be as well or better adapted to production on muck soil than any other hybrid sweet corn. A comparison of six yellow hybrid corns, five of which are commonly grown in sweet corn canning areas, is listed in Table 4. There was no significant difference between the yields of Golden Cross Bantam, Purgold, Illinois 10, and Iowana. Golden Cross Bantam with red tassel produced .6 tons less than the regular Golden Cross Bantam. An unreleased hybrid, Hoosier Bantam, produced .8 tons more than Golden Cross Bantam.

## Potash Losses on the Dairy Farm

(*From page* 10)

ther increases the amount and waste of the fertilizer elements. The greatest vegetative growth in such cases, however, is due to urine because the most soluble and active ingredients in the feces are removed during digestion, before voiding. On an equal weight basis, urine contains about 13 times as much potash and three times as much nirogen as the solid feces, all of which is very soluble and readily available to plants. This may seem surprising in view of the large amount of water contained in urine.

It is difficult to estimate summer losses of potash caused by leaching, poor distribution, and excessive concentration of manure while cattle are on pasture. A conservative figure would seem to be about 10 per cent. If cattle are on pasture six months of the year and each animal produces six tons of manure, 15 cows would produce 90 tons of manure. The potash content of this manure produced while cattle are on pasture would be at least 10 pounds per ton or 900 pounds of $K_2O$. A 10 per cent potash loss would be equal to the potash contained in 180 pounds of 50 per cent potash.

### Potash in Milk and Grain

The composition of milk varies with the kind of animal,[1] period of lactation, etc., but according to studies in Pennsylvania, milk contains an average of

[1] Forbes, E. B., et al. *Mineral requirements of milk production.* Pa. Bul. 319 (1935).

0.166 per cent $K_2O$. On the basis of 5,500 pounds of milk, which is the average production per cow on many dairy farms, it would require 9.1 pounds of $K_2O$ to supply that which is removed in the milk from one cow. Milk from a 15-cow dairy farm would thus contain 137 pounds of $K_2O$ or 274 pounds of 50 per cent potash.

In order to produce this milk, most dairymen feed large quantities of grain or dairy ration. In Vermont the better dairymen feed about one pound of grain ration to four pounds of milk (more in winter, less in summer). Therefore, to produce 5,500 pounds of milk per cow, farmers feed about 1,400 pounds of grain concentrate. The potash content of this concentrate varies somewhat with materials used, but a ton of 16 per cent dairy ration[2] contains about 12.8 pounds of $K_2O$. On the above basis, 15 dairy cows will consume 21,000 pounds of grain ration containing 270 pounds of 50 per cent potash.

Farmers who grow their own concentrate would have to purchase this amount of potash each year to balance the potash sold in milk. In Vermont, most of the concentrate is purchased because the land is needed to produce sufficient pasturage for summer use and hay and ensilage for winter feed. As long as farmers produce this amount of concentrate, they are able to balance the potash sold off the farm as milk.

The above calculations do not take into account grain purchased for calves and dry stock, but this does not much more than balance the potash contained in the bodies of old and young animals sold off the farm each year.

### Summary of Potash Losses

*Winter run-off losses.* A 15-cow farm will produce at least 90 tons of manure during the winter months. If this is spread on frozen ground, which is impervious to water, the spring thaw may cause a loss of potash equal to 420 pounds of 50 per cent potash. However, on most dairy farms, it is quite likely that this figure should be cut in half because the greatest losses occur on manure spread on frozen meadows and pastures during a three-month period (December, January, and February). Much of the soluble nutrients in manure spread before this time soaks into the ground. When manure is spread after February or March, most of the snow has gone and run-off is less. Furthermore, spreading manure on fall-plowed land which has a rough surface and many depressions also reduces this loss. However, even though the estimated losses are reduced by one-half, they are equivalent to the potash contained in 525 pounds of an 0-20-20 fertilizer.

*Summer losses.* When dairy cattle are on pasture, the manure is poorly distributed and its high concentration of nutrients over small areas greatly reduces its crop-producing efficiency. It has been estimated that the amount of potash lost each year on a 15-cow farm in manure deposited on waste areas together with that lost by leaching and poor utilization around urine spots is equivalent to that contained in 180 pounds of 50 per cent potash, or in 450 pounds of an 0-20-20 fertilizer.

*Potash removed in milk.* Each cow on a fairly good dairy farm will produce yearly about 5,500 pounds of milk. The potash content of milk varies somewhat but contains an average of about 0.166 per cent $K_2O$. Thus, the milk produced on a 15-cow farm contains potash equivalent to that contained in 274 pounds of 50 per cent material or in 685 pounds of an 0-20-20 fertilizer.

*Total potash losses.* The above figures make a total loss equal to the potash contained in 1,660 pounds of an 0-20-20 fertilizer (winter run-off, 525 pounds; summer losses, 450 pounds; and losses in milk, 685 pounds). It is quite likely that these figures are on the conservative side because over 95 per cent of the total potash in manure is soluble and subject to loss. The above figures on losses, exclusive of those sold in milk, represent only about

[2] Ration No. 1, *Morrison's Feed and Feeding.* P. 1017 (1939).

10 per cent of the total potash contained in the manure, which is a low service charge or loss for handling such large amounts of soluble potash.

*Potash purchased in grain.* Most dairymen feed large quantities of grain or concentrate. The potash content of this concentrate is about equal to that contained in 270 pounds of 50 per cent potash or that in 675 pounds of an 0-20-20 fertilizer.

*Potash needed to make up losses.* In general, it seems safe to conclude that it would be necessary to purchase and apply the following amounts of potash to maintain the potash on an average dairy farm of 15 cows at its present level. If grain is produced on the farm, it will be necessary to purchase potash equivalent to that contained in 1,660 pounds of an 0-20-20 fertilizer per year. If the grain is purchased, 975 pounds of a similar potash fertilizer will be required each year.

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## Rice Resurgent

(*From page* 5)

prospective harvest hit well above half a million acres. It is likely that from such an increased area to rice there will be fully 350,000 metric tons produced in hulled form. In Brazil, the allocation of domestic and export rice crops is directed by the officers of the Rice Institute. But after saving out 60,000 metric tons for their own use and for seed, the rest is expected to be shipped to other neighboring countries and to Great Britain—although the latter country temporarily laid off rice consumption to allow its share to be used in the big relief effort.

Down in the Santiago section where the Dominican Republic's big rice-growing is centered, the speculative fever has caught hold of the future market in spite of larger acreages and good outlook for a heavily increased output of irrigated and dry-land varieties. Cuba is also actively watching the chances to obtain rice in that zone. Consumers in the capital city of the Republic paid as high as 12 cents a pound early this spring for rice, all of which shows that a widespread price-kiting psychology has been evident in surplus rice regions, as well as in our own wheat sections since the world shortage of the basic breadstuffs became known. The very fact that rice is the staff of life for at least half the inhabitants of the globe means that a boom could easily become a bust, and selfish interests could defeat their own ends by expansion.

Mexico this season will probably plant about 200,000 acres to rice, or about a third of the area which Brazil contemplates harvesting. Reports from there indicate that they will need all they can raise this year without filling export orders, as supply in stores was short this winter in over half the country.

If the growers of rice and the investments in all our rice industrial developments were as enormous and basic as our vast wheat empire presents in those respects, the temporary world hunt for this cereal might threaten us with an unwise and risky boom. But probably within two years or even less, the recovery movement in the cheap and rapid tropical rice-raising countries of Asia will be such as to return us to a normal attitude.

That attitude was simply this—that since 1920, up to the war years, the acreage of United States rice culture declined about half. Growers felt that unless a big increase could be had in

per-capita consumption here, or unless our production costs could be severely reduced by the breeding and use of higher-yielding varieties, the boosting of rice investments here would be unable to meet Oriental volume at cut prices.

To buttress and defend our rice expansion with scientific research is logical. This apparently requires attack in at least three ways: (1) To make rice more attractive and palatable for humans and more economical and useful in its by-products for livestock; (2) to breed strains that will make our domestic growers better able to compete with yields of over 100 bushels an acre in Spain, 90 bushels in Italy, 80 bushels in Japan, and 60 bushels in Egypt, compared with 45 or 50 bushels average in this country; (3) to devise new industrial uses of rice straw and its hulls, starch, and polish.

No doubt further research in soil fertility requirements will parallel the program of providing us with better varieties from yield, disease-resistance, and milling quality. Popular conceptions of low, marshy, boggy waste-land as the best plantations for rice need to be corrected. On the contrary, rice thrives on rather level upland prairies, suitably located for irrigation to provide the water-bath levels required, plus the need for an average mean temperature during the whole length of the growing season which is close to 70° F.

TAKING up the food-value angle first, it has long been contended that polished rice lacking the bran coat is deficient in the B-1 vitamin, or thiamine. Beriberi and similar nutritional ailments of a serious nature are hastened in their development where polished rice is the mainstay. Naturally, here where we get such a wonderful variety of protective foods this deficiency in polished rice is not so serious, but this does not alter the case for finding ways to make rice foods retain all their best natural values.

Just lately news has been released by the Army about the new rice preparation process discovered by a guy who had never seen a rice field until 1938, when he visited California growers whom he found in despair over declining demand for their product. This man who is a Persian-American, Milton Yonan-Malek, soaks field rice in properly temperatured water which opens the pores of the kernel, whereupon a steam-jet pressure system blasts the brown bran layer inside the tissues of the grain. As the rice dries and hardens the vitamin content is locked inside.

FINALLY, the outer husks are removed, leaving a grain which is darker, of almost transparent amber color, and much harder than ordinary mill-polished rice. The Army, the National Research Council, and California college workers have tested and approved the method, so that before long we may all be familiar with "Malekized" rice and find it means larger domestic sales, too. This is because it is said to be more fluffy and uniform when cooked, regardless of variety used.

Experimental rice culture had its start in 1685 down in the Carolinas, where they grow hardly any these days —the zones of production having shifted completely across the southern map to the Gulf and Delta sections, on up to Arkansas, and west to California.

Through a century and a half the main reliance upon rice culture rested with Carolina White and Gold varieties. It remained for that noted plant explorer and father of extension work, Seaman A. Knapp, to bring in the first real Asiatic varieties, in the early nineties. Of the thousands of imported varieties and selections bred from them in our efforts to find bonanza rice sources, very few ever proved worthy of general use under our conditions.

Yet at branch station farms devoted to rice studies and with painstaking cooperation from commercial people

and pioneer growers, a few stand-by sorts have been tested. Each year sees new attempts to "make the best better."

If one called the roll of leading rice-plant developers and variety introducers, it would include a group of alert individuals who were happy to do something positive for an infant industry in search of "a home."

The list would carry the names of S. L. Wright, grower of Crowley, Louisiana, whose Blue Rose, Prolific, and Pearl contributed much to stability; and several Federal and State genetic workers, including Charles E. Chambliss, Jenkin E. Jones, J. M. Jenkins, and E. L. Adams.

Much could be said on the side as to the modest and retiring way that such men conduct their devoted quest. In some of our more prominently mentioned crops, success in breeding brings wide acclaim and much renown. With rice, however, as with honeybees and goats, only a small clientele linger around to hear and see what new things have come to light.

ONE might be confronted with a query from the big bread-basket centers of this land as to what significance there can possibly be in better rice-raising, when rice is confined by necessity to restricted places of culture.

That I cannot answer to satisfy the majority. But we certainly know that to engage in public work which will stabilize any staple crop in Dixie is bound to re-act in a protective, although indirect way, for other farm areas.

This country should aim to perfect each region's best natural possibilities, so as not to compete too much with each other on a few major products. In this effort we need a comprehensive plan and a recognition by all of what each is contributing or may contribute. Too often all we have is suspicion of log-rolling and sectional strife. That's no mood to be in if we are to stand by as a big reservoir of food, varied and ample enough to lend a real helping hand in times of suffering like this.


**TIME PROVEN**
**LaMOTTE SOIL TESTING APPARATUS**

LaMotte Soil Testing Service is the direct result of 26 years of extensive cooperative research with agronomists and expert soil technologists to provide simplified soil testing methods. These methods are based on fundamentally sound chemical reactions adapted to the study of soils and have proved to be invaluable aids in diagnosing deficiencies in plant food constituents. These methods are flexible and are capable of application to all types of soil with proper interpretation to compensate for any special soil conditions encountered.

Methods for the following are available in single units or in combination sets:

| | |
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| Ammonia Nitrogen | pH (acidity and alkalinity) |
| Nitrate Nitrogen | Manganeses |
| Available Potash | Magnesium |
| Available Phosphorus | Aluminum |
| Chlorides | Replaceable Calcium |
| Sulfates | |
| Iron | |

Tests for Organic Matter and Nutrient Solutions (hydroculture) furnished only as separate units.

LaMotte Outfit for determining available Phosphorus Complete with instruction—$12.50 f.o.b. Towson, Md.

Information on LaMotte Soil Testing Equipment sent upon request.

**LaMOTTE**
**CHEMICAL PRODUCTS CO.**
Dept. BC, Towson 4, Md.

## AVAILABLE LITERATURE

The following literature on the use of fertilizers in profitable soil and crop management is available for distribution. We shall be glad to send these upon request and in reasonable amounts as long as our supply lasts.

### Circulars

Tomatoes (General)
Asparagus (General)
Vine Crops (General)
Sweet Potatoes (General)
Better Corn (Midwest) and (Northeast)

### Reprints

T-8 A Balanced Fertilizer for Bright Tobacco
N-9 Problems of Feeding Cigarleaf Tobacco
F-3-40 When Fertilizing, Consider Plant-food Content of Crops
S-5-40 What Is the Matter with Your Soil?
K-4-41 The Nutrition of Muck Crops
E-2-42 Fertilizing for More and Better Vegetables
S-6-42 A Comparison of Boron Deficiency Symptoms and Potato Leafhopper Injury on Alfalfa
H-12-42 Wartime Contribution of the American Potash Industry
A-1-43 The Salt That Nearly Lost a War
H-2-43 Plant Food for Peach Profits
J-2-43 Maintaining Fertility When Growing Peanuts
Y-5-43 Value & Limitations of Methods of Diagnosing Plant Nutrient Needs
FF-8-43 Potash for Citrus Crops in California
PP-12-43 Commercial Fertilizers for Livestock Farms
A-1-44 What's in That Fertilizer Bag?
H-2-44 Efficient Fertilizers for Potato Farms
K-3-44 Soil Tests Indicate Potash Levels
T-5-44 Southern Crops Show Need of Potash
X-6-44 Soil Management for Cannery Peas
AA-8-44 Florida Knows How to Fertilize Citrus
CC-8-44 Soil Fertility's Effect on Asparagus
MM-12-44 Blue Lupine Is a Valuable Legume
QQ-12-44 Leaf Analysis—A Guide to Better Crops
A-1-45 Fertilized Corn Plants Require Well-Ventilated Soils
C-1-45 Fertilizers for Cotton and Corn Following Lespedeza
C-2-45 Some Whys and Wherefores for Air-Conditioning Soils
K-2-45 Plow-Sole Fertilizing on the Average Farm
P-3-45 Balanced Fertility in the Orchard
Q-3-45 Earliness Counts with Austrian Winter Peas
R-3-45 Higher Corn Yields for North Carolina
V-4-45 Yield and Quality of Cotton Can Be Improved by Boron
W-4-45 Fertilizing Golf Greens
Y-5-45 How Long Do the Effects from Fertilizer Last?
Z-5-45 Alfalfa—the Aristocrat
BB-5-45 Applying Experimental Work to Cotton Farming
DD-5-45 A Case of Combined Potassium and Boron Deficiencies in Grapes
EE-6-45 Balanced Soda in Orchards
FF-6-45 Orcharding from the Ground Up
GG-6-45 Know Your Soil
JJ-8-45 Plow-Under Practices
LL-8-45 Fertilizing for Better Soybeans in North Carolina
MM-8-45 Red Clover Suggests Shortage of Potash
NN-8-45 The Effect of Borax and Lime on Quality of Cauliflowers
OO-8-45 Potash Fertilizers Are Needed on Many Midwestern Farms
PP-10-45 More Vegetables for Less Money
QQ-10-45 A Little Boron Boosts Sweet Potato Yields
RR-10-45 A Potash-Nitrate Relationship in Corn As Revealed by Tissue Tests
SS-10-45 How to Start White Dutch Clover Pastures in Florida
TT-10-45 Kudzu Responds to Potash
UU-10-45 Soil Conservation—More Plant Food—Better Crops
VV-11-45 Borax on Crimson Clover in Tennessee
WW-11-45 What Is the Best Method of Applying Fertilizer
XX-11-45 Kudzu on Abandoned Land Needs Phosphate and Potash—Maybe Borax
YY-11-45 Potash—In War and Peace
ZZ-11-45 First Things First in Soil Fertility
AAA-12-45 Rapid Soil Tests Furnish One of the Implements for Increasing Crop Yields
BBB-12-45 Success with Blueberries
CCC-12-45 Poor Soils—Poor People
DDD-12-45 Efficient Crop Production Means Balancing Supply of Available Plant Nutrients
FFF-12-45 Florida's Legume Pastures Depend on Seed Source
A-1-46 Crop Production Horizons
B-1-46 Potash Increases Tomato Yield and Quality
C-1-46 A New Machine for Deep Fertilization
D-1-46 A New Legume for the South—Wild Winter Peas
E-1-46 The Sources of Potash for Flue-cured Tobacco
F-1-46 The Fertilizer Rate Problem
G-2-46 Profit on Mississippi Soils from One Ton of Potash under Cotton
H-2-46 Plow-sole Placed Plant Food for Better Crop Production
I-2-46 Boron Deficiency of Lettuce
J-2-46 Correcting Potash Deficiency in Growing Corn
K-2-46 Thank You Farm

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**THE AMERICAN POTASH INSTITUTE**

**1155 16TH STREET, N. W. WASHINGTON 6, D. C.**

The confident young man stopped in the apartment house hallway to call through the telephone. "Hello, baby," he said. "This is Gideon."

"There's so much noise on the line, I can scarcely hear you," came the voice of a gal on the other end of the line. "Who did you say it was?"

"Gideon, honey. G for gin, I for ice, D for drinking, E for excitement, O for ornery-eyed and N for necking. Got that, honey?"

"Well," answered the gal, "not all of it—but come on up anyhow."

---

What a pity human beings can't exchange problems. Everyone knows exactly how to solve the other fellow's.

---

"F-e-e-t," the teacher exclaimed. "What does that spell, Albert?"

"I dunno."

"Well, what is it that a cow has four of, and I have but two?"

So—Albert told her.

---

CURED

"Join us in a little game of stud, Colonel?"

"Sir, I do not play stud."

"I beg your pardon, I had an idea you did."

"Yes, I once had that idea myself."

---

A retired business man asked his six sons to Sunday dinner. As they sat down to eat, he said he had not made a will but was going to give $10,000 to his first grandchild. After asking the blessing he looked up to find he was the only one left at the table.

PHEW!!

Two buck privates paused by the roadside to look at a dead animal.

"It has two stripes—what is it?" said one.

"That settles the question," said the other. "It's either a skunk or a corporal!"

---

"You say he left no money?"

"No, you see he lost his health getting wealthy and then lost his wealth trying to get healthy."

---

Teacher: "What's the difference between caution and cowardice?"

Tommy: "Caution is when you're afraid, and cowardice is when the other fellow's afraid."

---

The Sunday school teacher asked her class to write down the names of their favorite hymns. All the scholars busied themselves with pencil and paper and presently handed in their papers. All except little Jane. "Come, Jane," said the teacher, "write down the name of your favorite hymn." Jane wrote, and with downcast eyes and flaming cheeks, handed the teacher a slip of paper bearing the words, "Willie Smith."

---

There's nothing like a wedding
To make a feller learn,
At first he thinks she's his'n,
But later learns he's her'n.

---

Beneath this tomb lies Murphy.
They buried him today;
He lived the life of Riley
While Riley was away.

*Need for—*

# BORON IN AGRICULTURE

Authorities have recognized that the depletion of Boron in soil has been reflected in limited production and poor quality of numerous field and fruit crops.

Outstanding results have been obtained with the application of Borax in specific quantities or as part of the regular fertilizer mix, improving the quality and increasing the production of alfalfa and other legumes, table beets, sugar beets, apples, etc.

The work of the State Agricultural Stations and recommendations of the County Agents are steadily increasing the recognition of the need for Boron in agriculture. We are prepared to render every practical assistance.

Borax is economical and very little is required. It is conveniently packed in 100 lb. sacks and stocks are available for prompt delivery everywhere in the United States and Canada. Address your inquiries to the nearest office.

**PACIFIC COAST BORAX COMPANY**

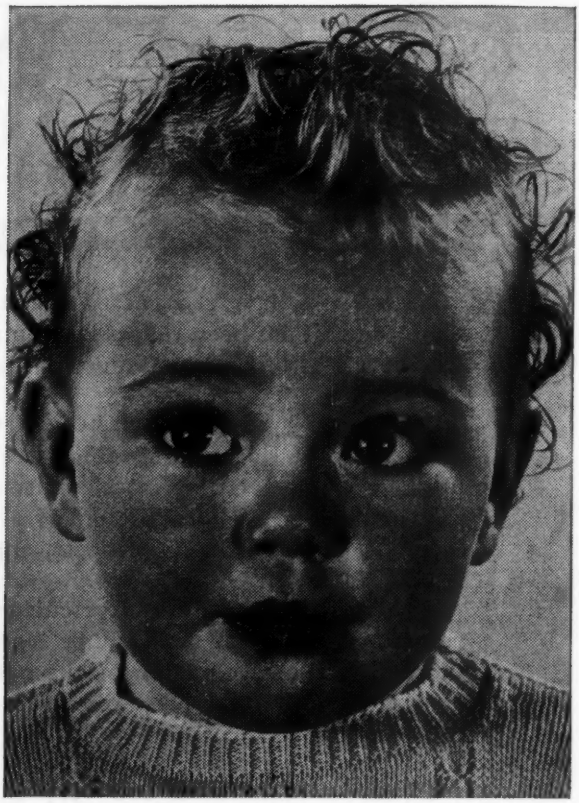
NEW YORK CHICAGO LOS ANGELES

# BORAX

*for agriculture*

20 Mule Team. Reg. U. S. Pat. Off.

# *The Meaning of*



WHAT are those letters on your building blocks, little boy? What do they mean? Today you are too young to read or pronounce them, much less understand them.

But during the years ahead you will come to know and recognize V-C as the trademark for V-C Fertilizers manufactured by Virginia-Carolina Chemical Corporation to serve thousands of fine folks like you and your family.

Your Dad uses plenty of V-C Fertilizers for every crop he grows, to produce the largest possible profit from his land, labor and machinery . . . profit to buy you a good education and all the comforts and advantages that make life better and happier.

By helping each acre of your farm yield as much as several poorly-fertilized scrub acres would yield, V-C Fertilizers save work, worry and expense. This means more time for your Dad to spend with you . . . and more money for your Mother and Dad to make the farm a more attractive home for you and your brothers and sisters.

The older you grow, little boy, the more V-C will mean to you. V-C scientific research, V-C practical farm experience and V-C manufacturing skill are constantly at work developing better and better V-C Fertilizers . . . so that when you are a man and your Dad turns the farm over to you, it will be a better farm because he used V-C Fertilizers.

**VIRGINIA-CAROLINA CHEMICAL CORPORATION**

Richmond, Va. • Norfolk, Va. • Greensboro, N. C. • Wilmington, N. C.
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VC FERTILIZERS

LEADER IN THE FIELD SINCE 1895

SERVING AGRICULTURE...THROUGH SCIENCE

# *Getting Information*

## TO MEN ON THE FARMS

IMPROVEMENTS in agriculture —no matter how outstanding —are of relatively little actual value until information concerning them gets to the farmers themselves. Accordingly, reports on our new chemicals for agriculture—PHYGON, TUFOR and SYNDEET—as well as supplementary data on SPERGON, appear regularly in the agricultural publications.

Findings of agricultural scientists and leaders over the country which contribute to the useful knowledge of these agricultural chemicals are thus channeled directly to the growers interested, through sources on which they depend for authoritative information.

County agents, extension workers, and other agricultural scientists are invited to send for the latest information on these products, or write us concerning specific problems.

US AGRICULTURAL CHEMICALS

**SPERGON**—*Seed Protectant*
**TUFOR**—*Selective Weed Killer*
**SYNDEET**—*Improved DDT Agricultural Spray*
**PHYGON**—*New Organic Fungicide*
**SYNTONE**—*Rotenone Emulsion Spray*

**UNITED STATES RUBBER COMPANY**

*Naugatuck Chemical Division*

1230 AVENUE OF THE AMERICAS, ROCKEFELLER CENTER, NEW YORK 20, N. Y.

# THE PLANT SPEAKS

A new four-reel series of 16 mm., sound, color films which may be booked independently or in any combination. They may be used to best advantage when shown at least one day apart and in the following sequence:

THE PLANT SPEAKS THRU DEFICIENCY SYMPTOMS pictures soil depletion, erosion, and deficiency symptoms on plants. (Running time 25 min. on 800-ft. reel.)

THE PLANT SPEAKS, SOIL TESTS TELL US WHY depicts taking soil samples on the farm and the interpretation of soil tests. (Running time 10 min. on 400-ft. reel.)

THE PLANT SPEAKS THRU TISSUE TESTS shows the value of tissue testing and the procedure for testing plant tissues in the field. (Running time 14 min. on 400-ft. reel.)

THE PLANT SPEAKS THRU LEAF ANALYSIS evaluates leaves in plant growth and leaf analysis in determining fertilizer needs. (Running time 18 min. on 800-ft. reel.)

We shall be pleased to loan these films to agricultural colleges, experiment stations, county agents, vocational teachers, responsible farm organizations, and members of the fertilizer trade.

OTHER 16MM. COLOR FILMS AVAILABLE FOR TERRITORIES INDICATED

Potash in Southern Agriculture (South)
In the Clover (Northeast)
Bringing Citrus Quality to Market (West)
Machine Placement of Fertilizer (West)
Ladino Clover Pastures (West)
Potash from Soil to Plant (West)
Potash Deficiency in Grapes and Prunes (West)
New Soils from Old (Midwest)
Potash Production in America (All)
Save That Soil (All)

IMPORTANT

Requests should be made *well in advance* and should include information as to group before which the film is to be shown, date of exhibition (alternative dates if possible), and period of time of loan.

**American Potash Institute**
1155 Sixteenth Street
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